

AUTOMOTIVE INDUSTRIES

A C H I L T O N P U B L I C A T I O N

APRIL 15, 1959

Features • • •

Machining Universal Joints at Chrysler Plant

Zinc Die Casting in 1959 Passenger Cars

Fixtures for Brazing Honeycomb Sandwich

Latest Developments in Heat Treating Equipment

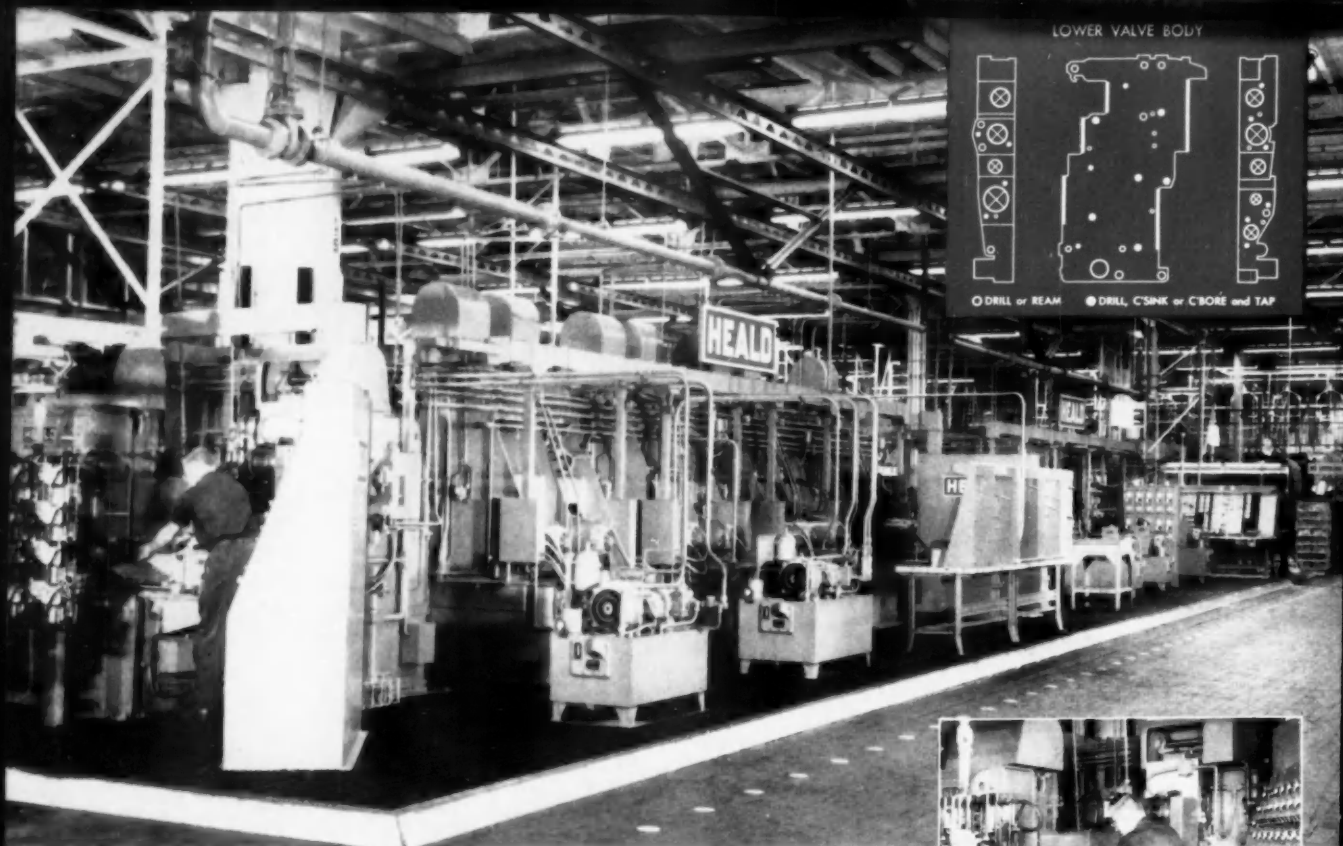
Tooling at British Ford to Make Dexta Tractors

High Spots of SAE National Automobile Week

COMPLETE TABLE OF CONTENTS, PAGE 3

Automotive and Aviation Manufacturing
ENGINEERING • PRODUCTION • MANAGEMENT





HEALD AUTOMATED LINE performs 171 OPERATIONS

*Two identical 39-station Bore-Matic transfer lines
drill, bore, ream, tap, face, probe and gage
48 bores and 5 side faces of transmission valve bodies*

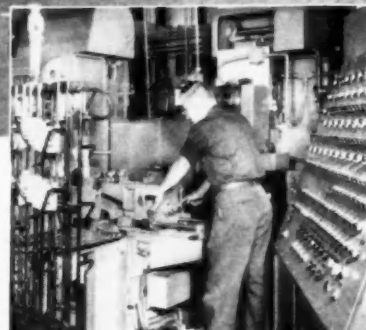
REPRESENTING the ultimate in straight-line automation, these Heald Model S Bore-Matic transfer lines are speeding the precision production of valve bodies at one of America's leading automotive plants.

Each line consists of two 50-foot sections—a 19-station section for the small-bore and semi-finish facing operations and a 20-station section for core drilling, reaming and finish facing. A total of 171 operations (112 machining, 52 probing and 7 air

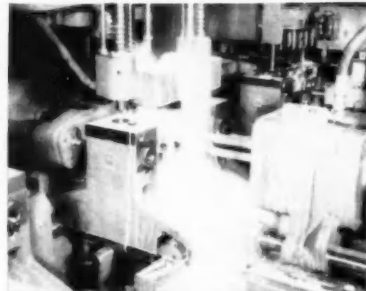
gaging) are performed in a fully automatic palletized transfer line with a cycle time of 18 seconds for each station.

Compared to previous methods, the new Heald system results in less handling and locating of parts, fewer rejects, greater efficiency and substantially lower production costs.

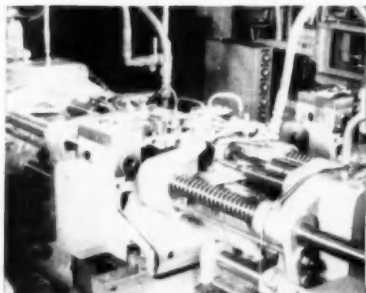
For complete information on this interesting installation, send for a copy of the February 1959 issue of *The Heald Herald*.



Parts come to machine on overhead conveyor and are semi-automatically loaded onto the transfer pallets. Push button control console for all stations is shown at right.



Tapping and drilling operation at Station 12 of Section 1. Probing station is shown in the background.



Core drilling of spool bores at Station 4 of Section 2. Bores are then semi-finish and finish reamed and air gaged for diameter.



IT PAYS TO COME TO HEALD!

THE HEALD MACHINE COMPANY

Subsidiary of The Cincinnati Milling Machine Co.

Worcester 6, Massachusetts

Chicago • Cleveland • Dayton • Detroit • Indianapolis • New York

Circle 101 on Inquiry Card, for more data



The little booklet on alloy steels that grew into a textbook...

Quick Facts about Alloy Steels appeared for the first time in 1956, as a collection of reprints of a series of Bethlehem advertisements in metalworking magazines.

The small booklet was well received, and we kept adding more of the informative advertisements as we reprinted it to keep up with demand. Today, it has grown to 40-page size, and is in its Third Edition. More than 20,000 booklets have been distributed at the written request of executives, engineers, designers, and others, who have found *Quick Facts* to be an authoritative small textbook on the funda-

mentals of alloy steels. Here's what a U. S. Navy engineer wrote:

"*Quick Facts* is a small textbook of information—a booklet that has been needed for a long time. One of my associates and I had a metallurgical problem involving alloy steels. We just didn't have the information. A friend showed me a copy of your booklet *Quick Facts*, and there on one page, under the subject 'Determining Depth Hardness,' was just what we wanted to know!"

The current booklet contains reprints of the complete series of advertisements, on such subjects as, "What

is an Alloy Steel?" "Effects of Elements," "Grain Size," "Heat-treatment," "Quenching Media," and others. It's written in concise, layman's language, from data compiled by Bethlehem's metallurgical engineers.

Would you like a copy of the *Quick Facts* booklet? Just fill out and send in the coupon.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA. On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation, Export Distributor, Bethlehem Steel Export Corporation

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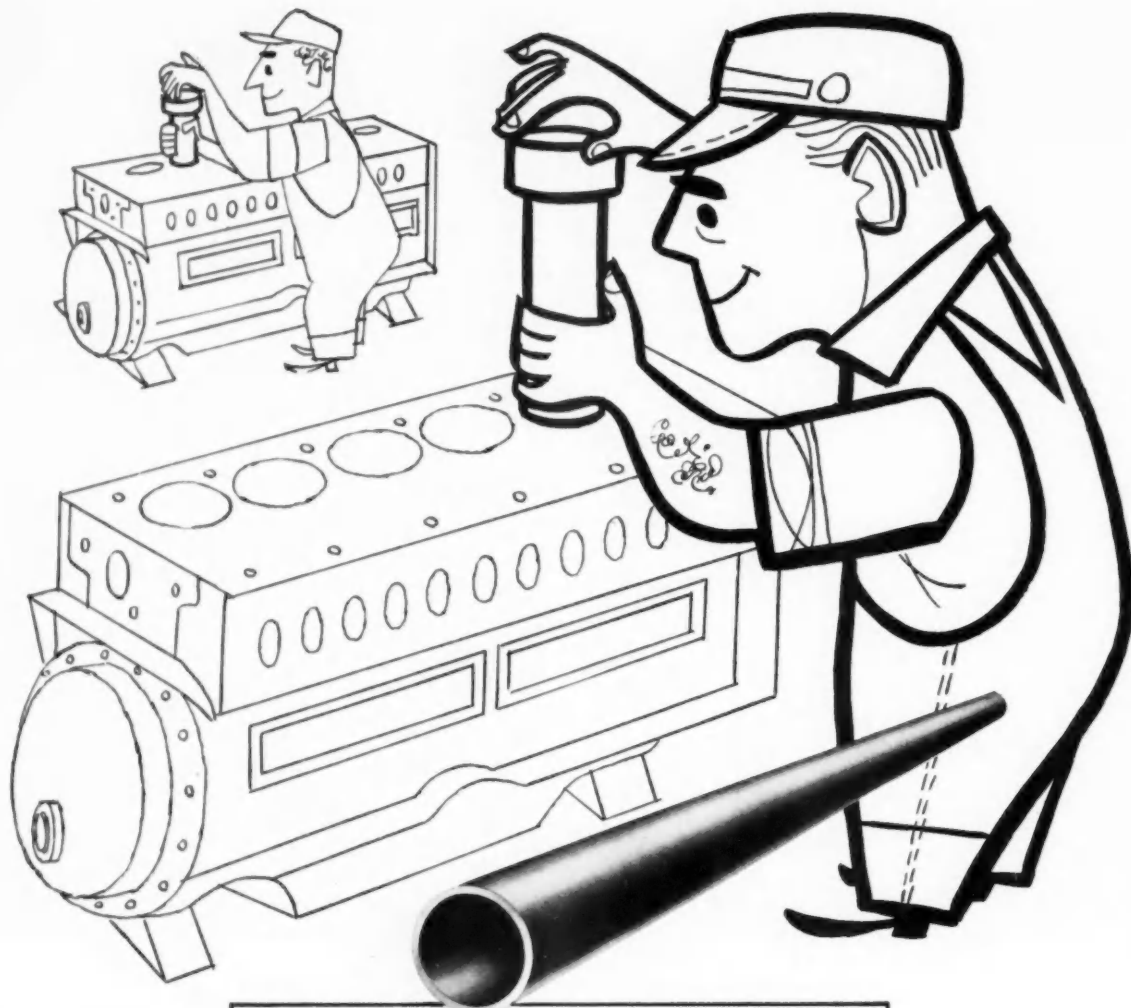
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How **B&W JOB-MATCHED TUBES** simplify production of Hydraulic Cylinders

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- ... a guaranteed maximum average micro-inch finish on the inside diameter
- ... close and uniform size tolerances to meet your specifications
- ... uniform mechanical properties for assured performance

The uniform inside finish of this type of tubing as

received from the mill eliminates or greatly reduces the necessity for boring, grinding or polishing for hydraulic applications. Continuous quality control at B&W—with ultrasonic testing supplementing regular, accepted methods of inspection—makes sure you get tubes *matched to your job*.

For complete information about B&W Job-Matched Smooth ID Welded Tubing call the local B&W District Sales Office or write for Bulletin TB-428. The Babcock & Wilcox Company, Tubular Products Division, Beaver Falls, Pennsylvania.



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Seamless and welded tubular products, solid extrusions, seamless welding fittings and forged steel flanges—in carbon, alloy and stainless steels and special metals

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TUBULAR PRODUCTS DIVISION

AUTOMOTIVE INDUSTRIES

A CHILTON MAGAZINE • PUBLISHED SEMI-MONTHLY

APRIL 15, 1959

VOL. 120 No. 8

Features • • •

▼ Chrysler Simplifies Machining

Chrysler engineers have reduced the machining of universal joints to five major steps, including heat treating. Page 36.

▼ SAE National Automotive Week

Light cars, electronic testing, exhaust systems, and a wide range of production problems, were among the topics spotlighted at the recent SAE meeting in Detroit.

Page 38.

▼ Latest Heat Treating Developments

The aircraft industry buys at least five per cent of the total output of heat processing furnaces in the U. S. This article describes some typical aircraft applications.

Page 40.

▼ How to Fixture Honeycomb Sandwich

What kind of firing fixtures should you use for brazing honeycomb sandwich? The answers to this and other questions—such as, what are the best materials for the job? How do you measure temperatures at extremes of the gradient?—are provided in this timely article.

Page 46.

▼ Leipzig Fair

Joint Communist planning for countries behind the Iron Curtain was evident at the recent Leipzig Fair. What this means for their automotive industries is told here.

Page 48.

▼ Limited-Volume Tooling for Tractors

British Ford is turning out about 150 of its new Diesel-engined Dexta tractors daily at its Dagenham plant. Tooling is the most modern for this volume, yet unnecessary automation has been avoided.

Page 50.

▼ Zinc Die Castings in 1959 Cars

How have recent styling changes in passenger cars affected the zinc industry? Here is an analysis of current zinc usage in both trim and automotive applications.

Page 52.

▼ 40 New Product Items, And Other Features, Such As:

Business pulse, airbriefs, news of machinery industries, trends in construction equipment, Washington wire, and industry statistics.

... continued on next page

MEMBER



National Business
Publications, Inc.



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of Circulations

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AUTOMOTIVE INDUSTRIES

Features . . .

News Previews . . .

Car Makers Boost Output	21
V-8 Option Offered on Chevrolet Trucks	21
Colbert, Wagstaff Deny De Soto Rumors	22
Churchill Sees Good Year as Lark Sales Rise	22
Chrysler Converting Plant to Make Own Glass	22
AMC Updates Metropolitan	23
Enough Steel on Hand for 1959 Model Runs	23
Ford May Not Offer Skyliner or Ranchero in '60	23
AMC Joins Sonotone to Study Electric Car	24
IHC Introduces New Line of Trucks	24
Twin Coach Develops Rack Rat	24
Goodrich Uses Steel Cord for Heavy-Duty Tire	24
British Car Maker Forms North American Subsidiary	25
Westinghouse Promotes Cresap to Chief	25
Beryllium Forged Successfully	26
Convair to Design Nuclear Plane Airframe	26
GE to Develop 2nd Stage Engine for Vega	26
Martin Honeycomb Machining Process	26
Grumman Gets \$107 Million Navy Contract	27
Aerojet to Develop 3 Stages of Solid-Fuel ICBM	27

Departments . . .

Calendar of Coming Events	8
News of th Automotive and Aviation Industries	21
Men in the News	28
Construction Equipment Trends. By Kenneth Rose	55
Industry Statistics	56
Machinery News. By Charles A. Weinert	58
The Business Pulse	60
New Plant and Production Equipment	62
New Automotive and Aviation Products	78
On Our Washington Wire	82
Airbriefs. By David A. Partridge	86
More Government Contract Awards	97
Shorties	104
Advertiser's Index	125
Free Literature	At Back of This Issue

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Now—brakes that adjust themselves! This latest Bendix braking development adds the powerful sales appeal of economy to the tried-and-true one of safety. More cars every year have this new feature—it's only a matter of time until they all do.



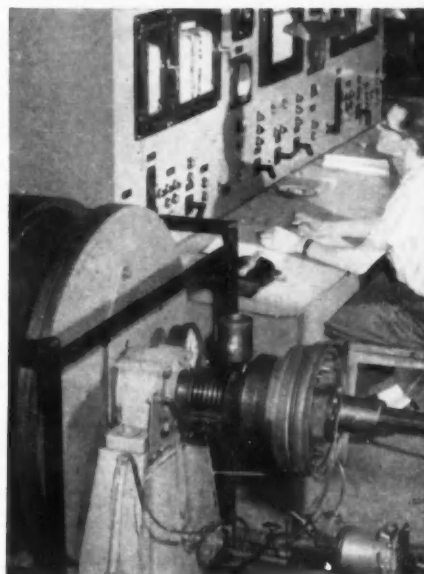
Helping make each model year as dramatic as a year-long "Opening Night", the automakers are seconded by suppliers

like Bendix Products Division. While master carmakers and designers are concerning themselves with problems of total design and concept, specialists like Bendix Products Division, working in specialized areas such as steering and braking, create innovations and improvements that take their place in the total design yet, in their own right, are powerful interest creating salesmakers.

Three of the sales successes de-

veloped by Bendix Products Division are shown at the top of the page. These and many others are being demonstrated on the road every day by practically every car on the road—and by millions of new cars sold every year.

In developing features like these, Bendix Products Division benefits from the planning talents, the research skills, and the production know-how of its own engineering staff first... but also from the unique Research Division and the 24 divisions of the Bendix Aviation Corporation. Through the products of Bendix Products Division, these talents are available to you, too. Why not put them to work for you?



Testing Torque and Temperature!

Research engineer checks various operating factors such as torque and temperature on a new brake design undergoing dynamometer test in Bendix Engineering laboratory.

Planning Committee in Session!

Almost endlessly they debate two key questions: "Will it work?" and "Will it sell?" Here's just one of the thousand of technical and strategy meetings at all levels that precede the launching of a new Bendix product.



Bendix PRODUCTS DIVISION
South Bend, IND.

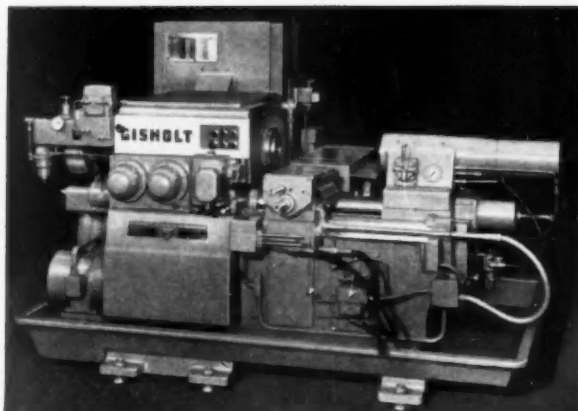


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WHICH IS MOST IMPORTANT TO YOU?



**Power
Speed
Versatility
Capacity
Quick Setup?**



Gisholt No. 12 Automatic Chucking Lathe

You don't have to sacrifice one advantage for another because here is an ideal combination of all in the industry's most modern high-production automatic chucking lathe.

This Gisholt No. 12 is quickly set up to save you time and money on continuous, high-speed production or a wide variety of parts in small lots. It can take practically any part up to 16½" in diameter.

COST-CUTTING VERSATILITY. With 420 spindle speeds ranging from 40 to 2600 r.p.m. and an infinite selection of feeds, it gives you top efficiency in all phases of every job—cutting costs all the way.

INCREASES OPERATOR PRODUCTIVITY. Each machining step is handled in rapid automatic sequence—freeing your operator to handle additional machines.

GREATER POWER, GREATER ACCURACY. Constant h.p. motor (up to 40 h.p.) on the No. 12 takes full advantage of today's most advanced cutting tools and tooling

techniques. Greater weight and rigidity allow heaviest cuts at punishing speeds without vibration.

COMPLETE RANGE OF ACCESSORIES. Front, rear, auxiliary and overhead slides can be used; angular cuts are easily made; JETracers can be used with greatest efficiency. Automation can be incorporated—from simple loading and unloading to gaging and sorting of finished pieces.

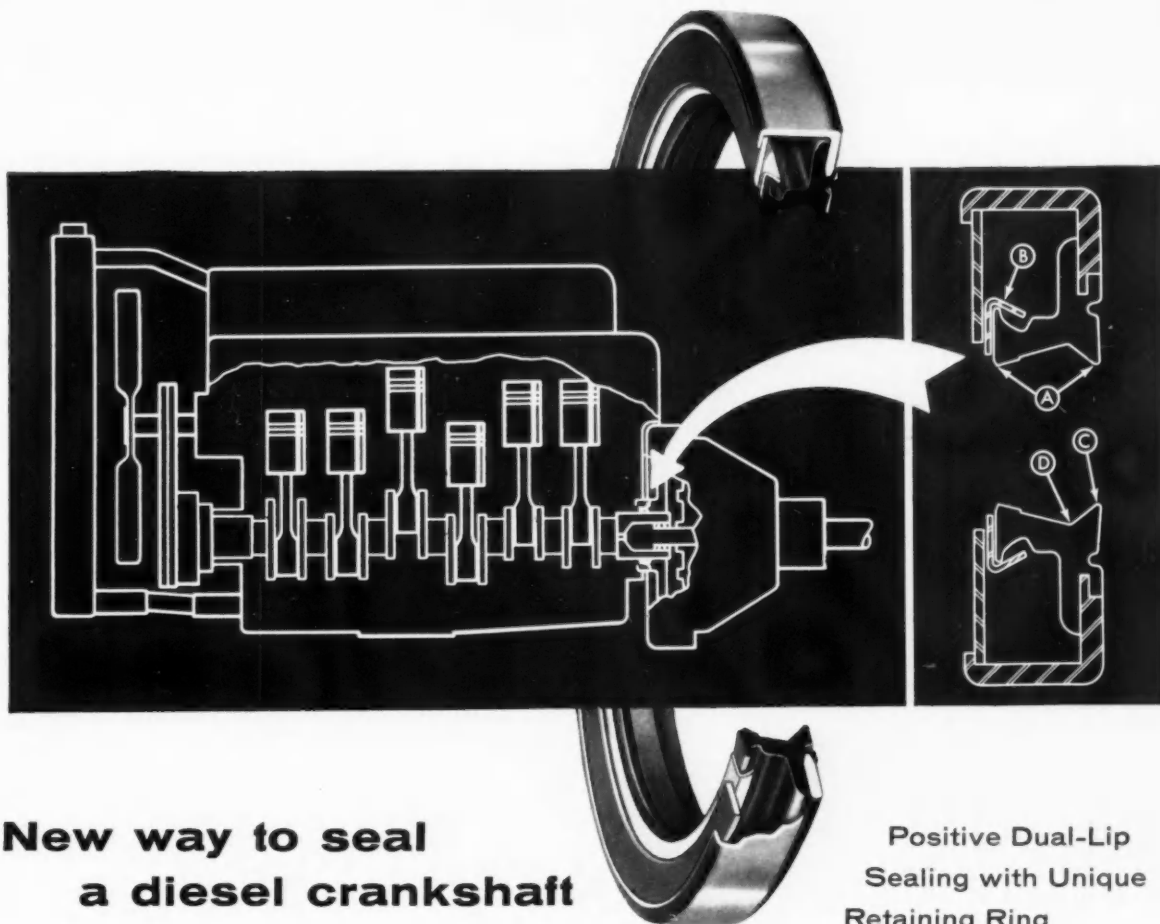
Your Gisholt Representative will gladly show you how the No. 12 Automatic Chucking Lathe will pay for itself in your plant. Call him, or write for Bulletin 1213.

GISHOLT  
MACHINE COMPANY

Madison 10, Wisconsin

**Investigate Gisholt's Extended
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Turret Lathes • Automatic Lathes • Balancers • Superfinishers • Threading
Machines • Factory-Rebuilt Machines with New Machine Guarantee



New way to seal a diesel crankshaft

Positive Dual-Lip Sealing with Unique Retaining Ring

The tremendous work loads being put on heavy-duty diesels call for a new look at sealing specifications. Stresses on the crankshaft often cause eccentricity with runout as much as .042 in. This makes holding a tight seal at the shaft rear extension with a standard seal design extremely difficult if not impossible. Another consideration is high working temperature—up to 300 deg. F.

Newest provision for this condition on a typical diesel is shown here. This unique yet simple modification of standard Victor oil seal design maintains positive mating of shaft and sealing element under any shaft divergence. The element—a silicone elastomer compounded by Victor—is good to 400 deg. F. intermittently.

In place of the usual garter spring, Victor engineers designed a unique retaining ring, loosely mounted over the sealing lip surface. The ring retains proper lip pressure while it permits the sealing element to follow the exact eccentricities of the shaft.

Have you a shaft sealing problem—or any problem involving oil seals or gaskets? Victor can help you solve it most economically. Contact your Victor Field Engineer or the factory. Victor Mfg. & Gasket Co., P.O. Box 1333, Chicago 90, Ill. Canadian Plant: St. Thomas, Ont.

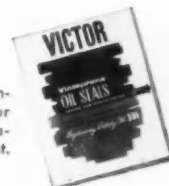
- A** Basic design is Victor Type K6 with dual-lip standard construction. Provides maximum fluid retention and exclusion of foreign matter. Sealing element is silicone rubber, integrally molded and bonded to steel case.
- B** Metal retaining ring loosely mounted over the lip replaces usual garter spring. Allows expansion of element when seal is installed on shaft, yet confines element and retains even lip pressure in operation.
- C** Outer or secondary lip is molded with very little interference, avoiding danger of turning back lip on installation. When shaft enters primary lip, interference of secondary lip is increased through lever action.
- D** Lubricant applied between lips before installation permanently lubricates the seal, reduces frictional drag, extends seal life.

VICTOR

Sealing Products Exclusively



A complete reference manual for designers—Victor Oil Seal Engineering Catalog No. 305. Sent on request.



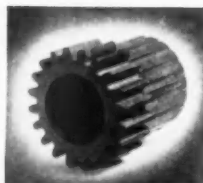
GASKETS • OIL SEALS • PACKINGS • MECHANICAL SEALS

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A TAYLOR laminated plastic gear is noiseless, acts as a safety valve in a gear train

You can solve two problems with a single gear made from TAYLOR laminated plastic silent gear stock. Noise of meshing gears can be eliminated. Damage due to destructive overloads can be localized to protect the rest of the gear train and equipment. And the laminated plastic gear will outwear metal under normal operating conditions. Look into the physical and mechanical properties of TAYLOR laminated plastic silent gear stock. It is adaptable to a wide variety of applications. Write TAYLOR FIBRE CO., Norristown 49, Pa.



Taylor

LAMINATED PLASTICS VULCANIZED FIBRE

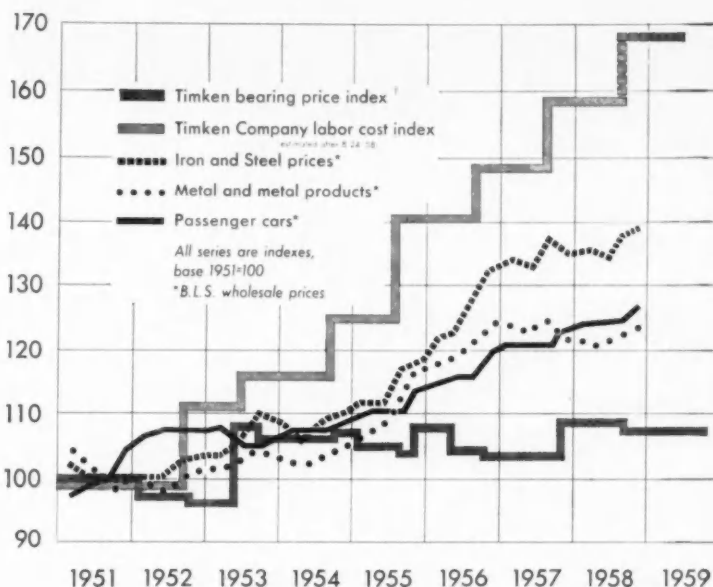
CALENDAR

OF COMING SHOWS AND MEETINGS

- ASTE Annual Meeting, Schroeder Hotel, Milwaukee, Wis. Apr. 18-22
- Metal Powder Industries Federation, annual meeting and Powder Metallurgy Show, Detroit, Mich. Apr. 20-22
- ASME Oil & Gas Power Conference and Exhibit, Shamrock-Hilton Hotel, Houston, Tex. Apr. 20-23
- ASLE Annual Meeting and Lubrication Exhibit, Hotel Statler, Buffalo, N. Y. Apr. 21-23
- Lead Industries Association, annual meeting, Drake Hotel, Chicago, Ill. Apr. 22-23
- Association of American Battery Manufacturers, annual convention, Americana Hotel, Miami Beach, Fla. Apr. 22-25
- American Zinc Institute, annual meeting, Drake Hotel, Chicago, Ill. Apr. 23-24
- Hannover German Industries Fair, Hannover, West Germany
Apr. 26-May 5
- National Chamber of Commerce, annual meeting, Washington, D. C. Apr. 26-29
- Manufacturing Chemists' Association, chemical products packaging Symposium, Engineering and Scientific Center, Cleveland, O.
Apr. 29-30
- ASME Metals Engineering Div. Conference, Albany, N. Y.
Apr. 29-May 1
- Conference for Protective Relay Engineers, sponsored by Illinois Institute of Technology, at Illinois Institute of Technology, Chicago, Ill. Apr. 30-May 1
- ASM Southern Metals Conference, Augusta, Ga. May 4-6
- National Industrial Production Show, Toronto, Canada May 4-8
- Interdisciplinary Conference on Self-Organizing Systems, sponsored by Information Systems Branch (Office of Naval Research) and Armour Research Foundation, Museum of Science and Industry, Chicago, Ill. May 5-6
- Industrial Waste Conference, Purdue Univ., Lafayette, Ind. May 5-7
- Institute of Radio Engineers, 7th regional conference and trade show, University of New Mexico, Albuquerque, New Mex. May 6-8
- World Car Show '59, Roosevelt Raceway, Westbury, L. I., N. Y.
May 8
- Copper & Brass Research Association, annual meeting, The Homestead, Hot Springs, Va.
May 10-13
- Second Annual Joint Conference on Automatic Techniques, sponsored by ASME, AIEE, and IRE, Pike Congress Hotel, Chicago, Ill. May 11-13
- Instrument Society of America, fifth annual symposium on instrumental methods of analysis, Shamrock-Hilton Hotel, Houston, Tex. May 18-20
- Society for Experimental Stress Analysis, spring meeting and exhibition, Sheraton Park Hotel, Washington, D. C. May 20-22
- American Society for Quality Control, annual convention and exposition, Hotel Sheraton, Cleveland, O. May 23-27
- ASME Design Engineering Show and Conference, Convention Hall, Philadelphia, Pa. May 25-28

BEAT INFLATION

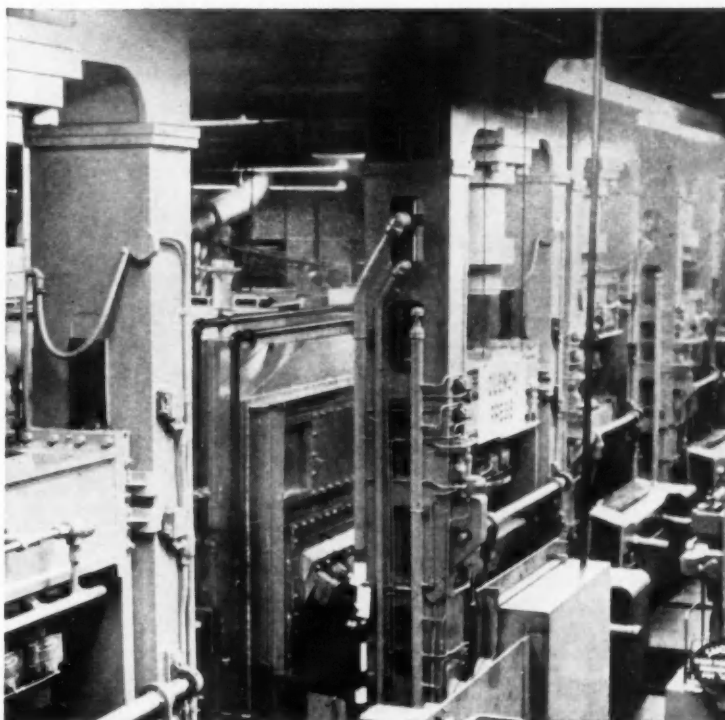
COSTS IN THE CHART look like something fired at Cape Canaveral. All but one. The cost line for Timken® tapered roller bearings is smooth as a new car ride. Auto makers themselves have helped hold prices down by: 1) standardizing on fewer bearing sizes; and 2) using more and more Timken "green light" bearings.



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WITH STANDARDIZATION

HERE'S THE PLANT that produces savings. Using high-speed mechanization, it gives auto makers a better bearing at low cost. The new Timken "green light" bearings are smaller than previous designs, yet capacity-packed. They help cut costs in related assemblies, too. Auto makers can create still more savings for themselves by finding new applications for Timken "green light" bearings. Ask our engineers to help you. The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO". Makers of Tapered Roller Bearings, Fine Alloy Steels and Removable Rock Bits.



TIMKEN® TAPERED ROLLER BEARINGS

First in bearing value for 60 years



STAMPINGS BY ACKERMANN



Hard-to-make parts cost less...

...when they're made by Ackermann. Our engineers will work with you to solve design problems. Then we'll mass-produce the parts . . . assemble them . . . and ship completed components to you.

Yet this unusual service is amazingly economical. That's because Ackermann has modern equipment . . . metallurgical and engineering specialists

and expert craftsmen. In fact, *everything* needed to bring you the finest, most economical stampings possible.

Let us show how Ackermann job-engineered stampings can save you both time and money. Ackermann Manufacturing Company, subsidiary of Wheeling Steel Corporation, Wheeling, W. Va.

IT'S WHEELING STEEL



WHY 500 BLUE CHIP COMPANIES LUBRICATE COSTLY MACHINERY WITH ALEMITE OIL-MIST SYSTEMS

An Alemite Oil-Mist Lubrication System provides safe, foolproof, automatic lubrication . . . increases machine output . . . reduces lubrication costs.

Designed for a wide range of applications. Oil-Mist provides constant, uniform lubrication of many sizes and types of bearings, from small sewing machine bearings to large steel mill back-up roll bearings or work roll bearings. Open type and enclosed gear trains and chain drives are lubricated by Oil-Mist when leakage problems exist. An Oil-Mist System is also ideal for

lubricating slides, ways and cams, where a minimum of continuous lubrication is required.

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Cut costs . . . reduce man-hours and machine down-time . . . extend bearing life . . . increase production . . . with a modern Alemite Oil-Mist Lubrication System

Write today for free Oil-Mist catalog!
Dept. Y-49, 1850 Diversey Parkway, Chicago 14, Illinois





Oil Seal Selector Chart

The data given below indicate, for most common applications, the type of oil seal that will operate best under given conditions. Where one or more parameters are extreme, modified or special seals may be required. For engineering help or availability details, call the nearest National Seal Engineer. Look under Oil Seals, in the Yellow Pages.



50,000 series
Micro-Torc
Leather



450,000 series
Syntech
Synthetic



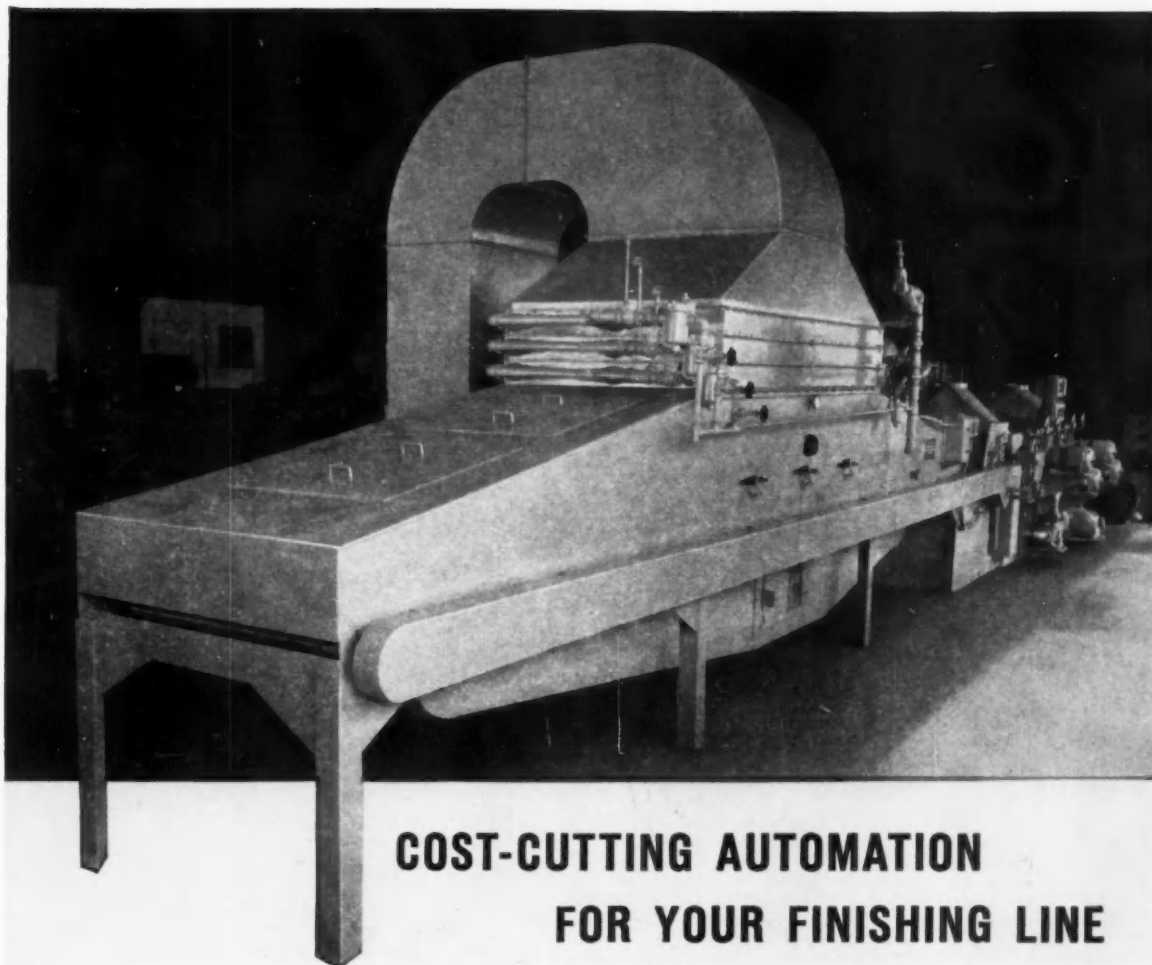
410,000 series
Syntech
Synthetic

MATERIAL SEALED	Mineral base oils and greases are most common materials. Availability of lubricant, criticalness of service, and cleanliness strongly influence construction choice. National Micro-Torc leather seals are recommended for grease and oil applications and particularly where semi-starved lubricant conditions may exist. For oil and fluid "zero leakage" service Syntech seals are normally considered. For applications involving both "zero leakage" and heavy dirt conditions, the user may wish to consider dual lip Syntech seals.			
SHAFT SPEED	Prime factor in seal selection. Governs all other factors. Shown in FEET PER MINUTE AS SLOW, MODERATE, HIGH.			
FPM	Slow Moderate High	0 to 800 800 to 1500 1500 to 2000	0 to 1000 1000 to 2000 2000 to 3000	0 to 1000 1000 to 2000 2000 to 3000
TEMPERATURE	Limits shown are points where sealing material or medium sealed becomes ineffective. For sealing under extreme temperature conditions, special compounds can be employed.			
LIMITS °F.	Continuous Intermittent	-65° +200° -65° +225°	-65° +225° -60° +250°	-65° +225° -60° +250°
PRESSURE	Conventional oil seals are not pressure seals. Where pressures above those shown exist, special seals should be employed or pressure against sealing lip relieved.			
MAXIMUM PSI	Slow Moderate High	15 10 5	10 7 5	10 7 5
SHAFT FINISH	Fineness and type of finish, direction and spiral of finishing marks and leads as well as RMS value affect sealing. Polished or ground finishes with concentric finish marks are preferred.			
MAXIMUM MICRO INCHES	Slow Moderate High	25 20 20	25 20 20	25 20 20
SHAFT HARDNESS	Although shafts as soft as cold rolled steel can be sealed successfully, hardness of C20 Rockwell or greater is preferred. Fluid starvation, abrasives and high surface speeds require hard shafts.			
SUGGESTED ROCKWELL	Abrasives No abrasives	above C-45 above B-80	above C-45 above B-80	above C-45 above B-80
SHAFT TO BORE MISALIGNMENT	Fixed misalignment of center of shaft rotation with bore center. Concentrates wear at one side of seal. Becomes more severe as speed increases.			
TOTAL INDICATOR	Slow Moderate High	.010 .005 .005	.015 .010 .010	.015 .010 .010
SHAFT RUN-OUT	Oscillating non-concentricity between shaft and bore centers (also eccentricity or shaft whip). Run-out should be kept to absolute minimum; creates difficult sealing problem.			
TOTAL INDICATOR RPM	0-800 800-2200 2200-4200	.010 .005 .003	.025 .020 .015	.025 .020 .015

NATIONAL SEAL

Division, Federal-Mogul-Bower Bearings, Inc.
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Plants: Redwood City and Downey, California
Van Wert, Ohio





COST-CUTTING AUTOMATION FOR YOUR FINISHING LINE

... another feature of Pennsalt's complete metal preparation service

Go automatic with Pennsalt machinery for applying metal finishing chemicals and lubricants ... and profit in several ways. These custom-engineered machines range from complete processing lines to relatively simple agitated tank cleaning units. They are designed for easy control, compact size and high output, and assure first-quality results and utmost economy in applying deep drawing lubricant, paint bonding, paint stripping, cleaning, etching and other finishing operations.

Pennsalt machines save space: they're compactly designed to fit easily into production lines. They

eliminate hand labor and give speeds up to 600 feet per minute. Initial cost is surprisingly low and operating costs are minimized.

Save with Pennsalt materials, too—a complete line of metal cleaners, phosphate coatings and drawing compounds that assures you the processing compounds exactly suited for each job, at lowest cost.

Profit from personalized service. Pennsalt engineers from our nationwide field organization analyze your process, supervise installation and startup of automatic machines, and make regular service calls to keep them running at top efficiency.

... a better start for your finish®

Call or write today for a consultation.

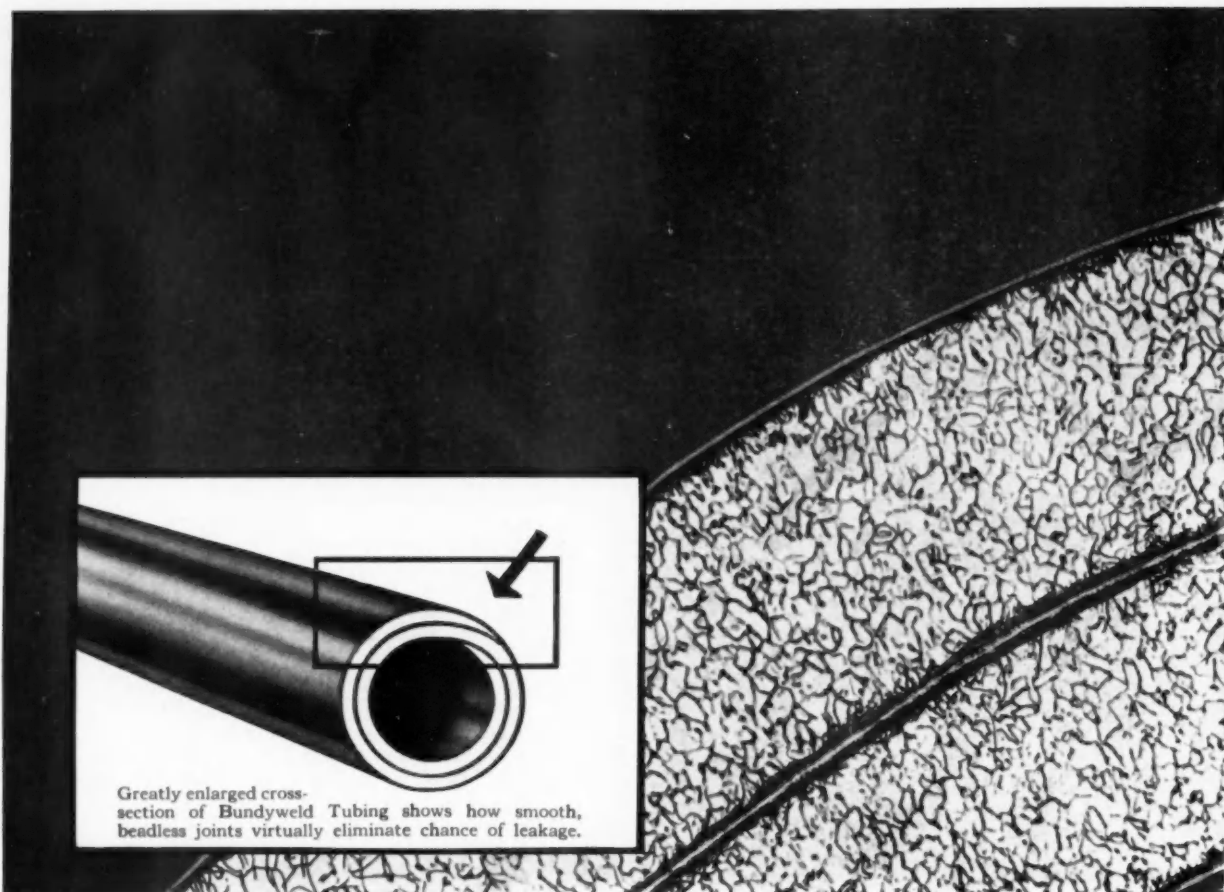
Metal Processing Department 706

PENNSALT CHEMICALS CORPORATION

Three Penn Center, Philadelphia 2, Pa.

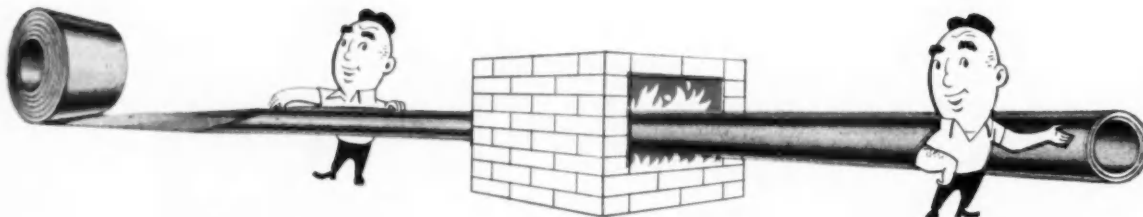


WHY BUNDY LEADS IN MASS-FABRICATION:



BEVELED EDGES...Another reason why Bundyweld

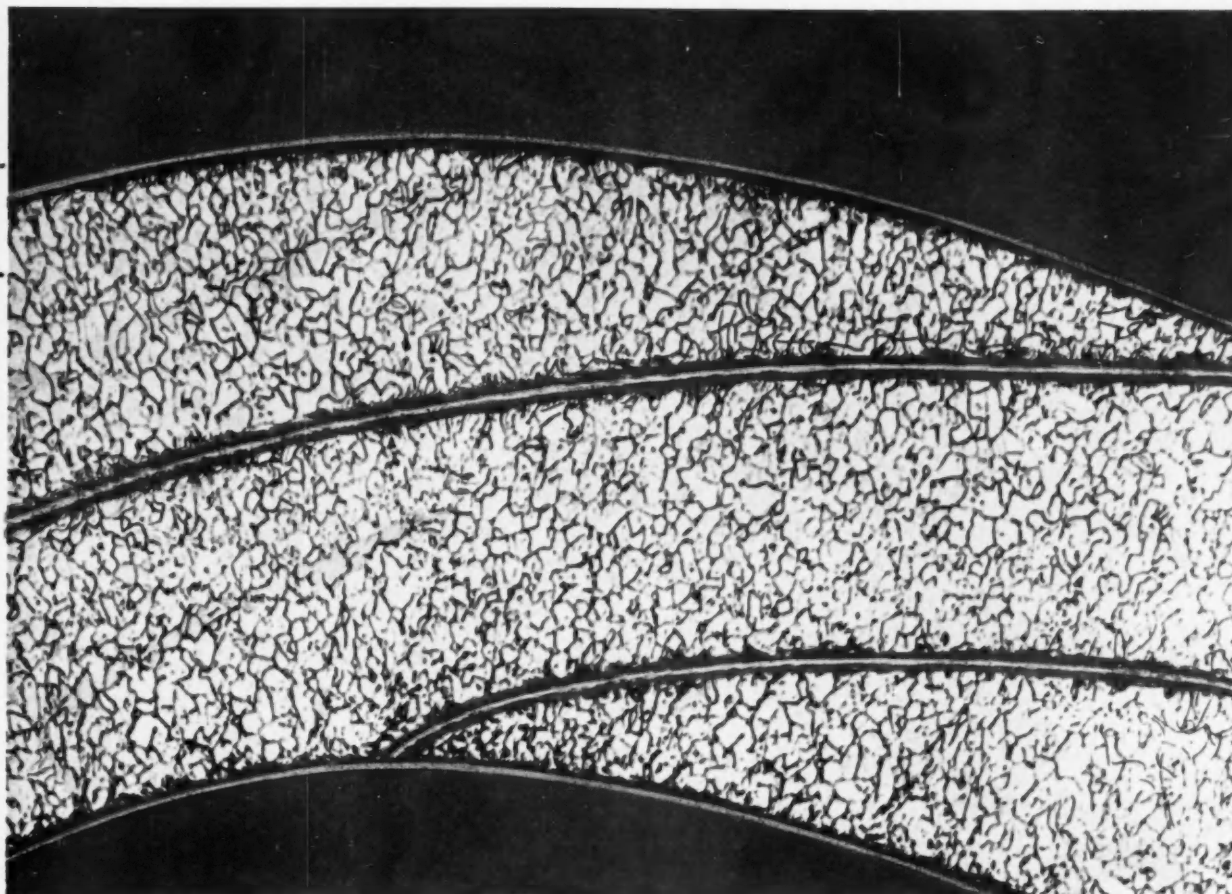
And Bundyweld can be mass-fabricated with speed and precision—at minimum unit-cost because of these Bundy advantages:



Bundyweld starts as a single strip of copper-coated steel. Then it's continuously rolled twice around laterally...

into a tube of uniform thickness, and passed through a furnace where copper coating fuses with steel.

Result: Bundyweld Tubing—double-walled, beadless, metallurgically bonded through 360° of wall contact.



is stronger, smoother, easier to fabricate

These Bundy®-developed beveled edges provide smooth, beadless joints, inside and out; insure full, double-walled strength however the tubing is cut or bent. They're *one* reason why Bundy leads in mass-fabrication; here are three more:

Bundyweld® Tubing is double-walled from a *single* strip, copper-brazed for high strength and resistance to vibration-fatigue in fluid-transmission or mechanical applications. From brakelines to pushrods, Bundyweld is on 95% of today's cars, in an average of 20 uses each.

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two-terminal flasher


Like the three-terminal 534 and 535,
it's built with twice the life of other flashers

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—and into space

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News

OF THE AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 120, No. 8

April 15, 1959

Car Makers Boost Output As Production Tops 1.6 Million

All five car companies boosted their output during the first quarter of 1959 as production topped 1.6 million passenger cars, a gain of some 27 per cent over the year-ago period.

Even Chrysler Corp., slowed down by a glass supplier's strike in February, substantially passed its 1958 performance with a strong month of March, when 100,156 cars were built. This gave Chrysler a three-month total of 177,797 cars.

A year ago, Chrysler built only 157,650 cars through March. The corporation is scheduling 100,000 cars each month through July.

Plymouth fell short of its 1958 total by 5300 cars, but the division's March showing of 58,890 units nearly erased the difference. A strong month of April is indicated.

Lincoln Produces Less

Lincoln was the only other individual make to produce less than a year ago, missing its 1958 total by a scant 701 units. Edsel, on the other hand, was solidifying its place in the market with sales and production gains. Production for the period totaled 13,734 units, well above the 4060 built a year ago.

There were a few cutbacks in March as auto makers began to level off their inventories. Chevrolet cut back slightly at several regional plants, and Buick reduced its work force in Flint substantially. Buick production, however, continued to run ahead of last year by about 7200 cars.

But despite these and other minor cutbacks, the industry's total for March was 576,085 cars. This compared with only 357,049 a year ago and represented an increase of 100,000 over February.

Little Two Boost Production

The so-called Little Two—American Motors and Studebaker-Packard



ASTON MARTIN HAS FULLY AUTOMATIC TRANSMISSION

Aston Martin DB Mark III for 1959 is now available with fully automatic Borg Warner transmission. The braking system features a Baldwin hydro booster, which provides simple two stage assistance to the pedal pressure required. The booster unit, which acts as an auxiliary master cylinder, is installed between the master cylinder and the four wheel cylinders. Car is powered by a six-cylinder, 178-cu in. engine that develops 162 bhp at 5500 rpm and has a compression ratio of 8.6 to 1.

—continued to make further inroads with by far the biggest production increases.

American Motors built an all-time high of 35,568 Ramblers in March, giving a quarterly total of 100,258 units. Year-ago figures were 10,000 cars in March and 41,183 for the three months.

AMC plans a 14 per cent increase in output during April, scheduling 40,500 cars, or a daily rate of 1560. The company continued its heavy overtime schedules at both Milwaukee and Kenosha.

S-P built 17,937 Larks during March for a total of 50,076 for the period. A year ago the firm produced 4091 vehicles during the third month and 9520 during the first period.

Pontiac, with 115,952 units, continued in third place behind Chevrolet and Ford, but sixth-place Plym-

outh was gaining fast as the period ended, and should overtake Rambler, Oldsmobile and Pontiac before the end of April.

Truck production during the quarter topped 305,000, some 175,000 units ahead of last year.

V-8 Engine Option Offered On Chevrolet Two-Ton Trucks

Chevrolet is offering a light-duty V-8 engine option for two-ton trucks in its 6000 series. The engine develops 160 hp with a 283 cu in. displacement. It is equipped with cooler running spark plugs, an 11 in. clutch with steel-backed facings, dual belt drive and five-blade fan.

The engine is available on trucks of less than 19,000 gvwt, except for forward control models.



FRENCH TRUCK CAN GO ANYWHERE

The Berliet T-100, described as the "world's largest truck," will be displayed at the International Petroleum Exposition at Tulsa, Okla., May 14-23. Because of the low pressure of its tires, the huge vehicle travels easily over long distances where there are no highways. The truck, built by Automobiles M. Berliet of France, is 41 ft long, 16 ft wide, and 13 ft high. It is powered by a 600-hp Cummins VT-12 Diesel engine.

Colbert, Wagstaff Spike Rumor De Soto Will Be Discontinued

Chrysler Corp. officials have labeled false a persistent rumor that the De Soto car would be discontinued in the near future. President L. L. Colbert and De Soto general manager J. B. Wagstaff have revealed that the division is investing nearly \$25 million in its future models.

But there are definite indications that De Soto will trim its model lineup in 1960 to offer about six models in a single series on a 122-in. wheelbase.

Currently De Soto lists 18 models in four series and two wheelbases, 122 and 126.

De Soto Planning Ahead

Wagstaff said commitments have been made on the 1960 and 1961 models, and that development work is in progress on the 1962 models. The 1963 models are on the drawing boards, he added.

Rumors of De Soto's demise started last summer when the division vacated its own manufacturing and assembly plants on Detroit's western boundary. The division now shares office space in Chrysler Div.'s East Jefferson plant, and De Soto cars are

built in the Chrysler and Dodge plants.

The former De Soto assembly plant is now occupied by Imperial, and the stamping plant is being converted to glass fabrication.

Rising Demand Seen

Wagstaff said in a recent meeting that De Soto is looking forward to a rising long-range demand for its cars, spurred by the rapid growth of the population and the steady increase in the standard of living.

One thing is in De Soto's favor for the coming year. Despite the cutback in the number of model offerings, De Soto dealers will have the upcoming Chrysler small car, since nearly all of De Soto's 2100 dealers are teamed in some way with Plymouth.

Plymouth, incidentally, will have fewer dealers, but probably stronger ones.

The Plymouth-Dodge duals will be split, leaving these Dodge dealerships to go it alone in 1960. But Dodge will have a fuller line, including a short wheelbase model. According to the Detroit reports, Dodge will offer two series on a 122-in. wheelbase and three more series on a 118-in. wheelbase.

Churchill Predicts Good Year As Lark Sales Keep Climbing

With sales and production of the Lark still climbing, Harold E. Churchill has predicted a profitable year for his corporation.

In the S-P annual report, Churchill said that immediate acceptance of the Lark in the final three months of 1958, coupled with year-end adjustments, reduced the company's loss for the year from \$22.5 million at the nine-month period to \$13.4 million for the year.

S-P showed a profit of \$3.6 million in the final quarter. The operations have continued profitable in the first quarter of 1959, he said.

Through March 31, S-P built 50,076 passenger cars, including 17,937 during March. This is more than five times the 1958 first quarter production of 9520 cars.

S-P's sales penetration so far this year has climbed to about 3 per cent of total market, or about three times what it was last year. This, with a larger total market in 1959.

Sales in the fourth quarter of 1958, when the Lark was on the market, amounted to \$88.6 million, only slightly less than the total for the preceding nine months. Sales in the first quarter of 1959 no doubt will top this.

Churchill added that one of the forward steps in operations has been the growth of the dealer organization, which now numbers 2500 dealers.

Chrysler Converting Plant To Make Own Glass Parts

Chrysler Corp. is converting its McGraw stamping plant in Detroit to glass production, and plans to turn out 50 per cent of the corporation's requirements.

L. L. Colbert, Chrysler president, said the plant will start installing glass fabricating equipment in June and begin production by early 1960. Stamping equipment already is being removed from the plant, which formerly was a part of the De Soto complex. The plant has been idle since the end of 1958 De Soto production.

Although Colbert would not reveal a dollar figure, one Detroit source placed the cost of conversion at \$6 million. The plant will employ 400 at full production.

Chrysler assembly activity was virtually frozen earlier this year by the marathon strike at Pittsburgh Plate Glass Co., the corporation's sole supplier. Colbert said the plan to produce glass had been under consideration for some time, and the strike brought the matter to a head.

Only Imperial and Dodge truck pro-



DIVCO-WAYNE UNVEILS NEW ALUMNI-VAN

Divco Truck Div. of Divco Wayne Corp. introduced a new truck for bakery, dry cleaning, and laundry markets called the Alumni-Van. The new forward control truck features an all-aluminum cargo body, steel-enclosed safety cab, and the Divco multi-stop chassis, which is specially designed for delivery services.

duction was unaffected by the shortage of glass. In the other passenger car divisions, the corporation lost production of about 100,000 cars during the period.

Chrysler will purchase raw glass on the outside, and use its own facilities to bend, temper and laminate to specifications.

AMC Updates Metropolitan As Spring Season Opens

American Motors has updated its English-built Metropolitan with several functional changes to prepare for the Spring selling season. Included are a new outside trunk lid, side window vents, a new seat adjustment mechanism, larger tires and improved seat cushioning.

The changes are planned to add appeal to the 85 in. wheelbase car without substantially changing its basic design and construction. This is in line with AMC's policy of upholding market value of its products.

The changes also kill the rumor that AMC again is considering building the car in this country. This report, which actually stems from George Mason's original idea in developing the Metropolitan, was revived when AMC announced it had produced pilot models of its V-4 aluminum engine (see AI Feb. 1, p. 18).

According to trade sources, AMC had been considering building the car in this country and equipping it with the V-4. The trunk lid change in par-

ticular, requiring special tooling in England, would seem to negate this possibility, at least for the present.

The Met is built for AMC by British Motors Corp., and it is powered by the Austin A-55 four-cylinder engine.

Enough Steel Now On Hand To Finish 1959 Model Runs

The automobile industry, faced with the possibility of a major steel strike in July, already has enough steel on hand to finish 1959 model production. In fact, two of the Big Three say they have sufficient supplies, or can put their hands on enough, to start up 1960 production.

Chrysler Corp. has stockpiled enough steel to carry 45 days into

1960 production, according to L. L. Colbert, corporation head. Ford Motor Co. has built its inventory to carry through the third quarter, which would include the '60 start-up.

General Motors, not quite so definite in its statement, indicates it has more than enough to finish out the current model run, but how much longer would depend on the length of a steel strike.

Chilton's *The Iron Age* has predicted there will be a strike lasting six to eight weeks.

Ford and American Motors both have pointed out the difficulty in building steel inventories during recent months of rising production.

Colbert, incidentally, said his company's 45-day supply for 1960 production does not include provision for a small car, if Chrysler should decide to have one. Since it is a virtual certainty that Chrysler and its two major competitors will build small cars next fall, the steel could not last 45 days.

Colbert added that he does not believe a strike could last long enough to interfere with 1960 models.

Report Ford Will Not Offer Skyliner or Ranchero in 1960

Ford Div. is not expected to offer its Skyliner retractable hardtop or the Ranchero pick-up truck in 1960.

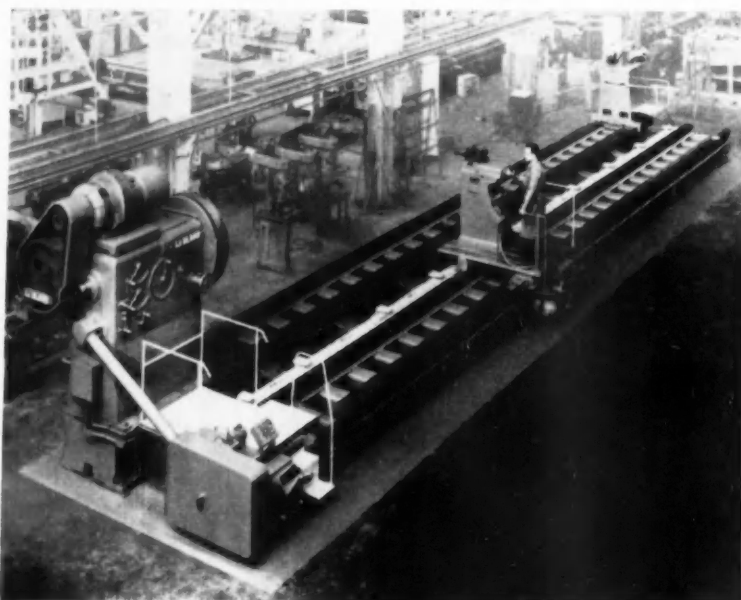
Ford is rushing through a new body program for 1960 which originally was scheduled for the following year. Special tooling required for the Skyliner and Ranchero was deferred in the rush to get the volume cars ready.

The Skyliner was introduced in December of 1956. Production during 1959 model year, through February, totaled 7800 units, and for the complete model year of 1958, 14,413 units.

Ranchero, which used standard passenger car sheet metal and other components, totaled 9950 units during 1958 and 7400 through February this year.

AMC's English-built Metropolitan has a new outside trunk lid, side window vents, and a new seat adjustment





HUGE LATHE SHIPPED TO AEROJET GENERAL

This double-bed lathe, built by R. K. LeBlond Machine Tool Co. has been installed at the Azusa (Calif.) plant of Aerojet-General, Inc., where it will be used in the manufacture of rockets. First of its kind to be built in the U. S., the giant machine tool weighs more than 75 tons and is 54 ft. 6 in. long, and 120 in. wide. It can handle a workpiece 45 ft long and 150 in. in diameter. It has a full range of speeds from 1 to 110 rpm, and feeds as low as 0.01 in. per revolution. The spindle is equipped with an electric brake for quick stops.

AMC Joins Sonotone To Study Electric Car With Generator

American Motors and Sonotone Corp. have launched a joint research program aimed at development of an electric automobile with a generator to supply constant power.

George Romney, AMC president, says the project could "open up a whole new area of automotive power." He warned, however, that the long-range program might not result in a vehicle that would prove feasible and economical.

The research project is based on a sintered-plate, nickel-cadmium battery which is smaller and lighter than conventional batteries of comparable energy output.

Such a battery costs more to produce, but Sonotone president Irving I. Schachtel says it can withstand great overloads and can be recharged in less time. The original battery would last the life of the vehicle, he says.

A generator powered by a small high-performance engine would recharge the battery during operation.

The AMC-Sonotone plans come on the heels of recent announcements that electric vehicles are being produced by firms in San Diego and Cleveland. Both companies, Stinson Tool & Engineering and the Cleveland Vehicle Company, say their vehicles will be limited to less than 100 miles in range.

Meanwhile, in Detroit, De Soto engineers have been exploring the possibility of a fuel cell car on which the braking action would regenerate power.

IHC Introduces New Line Of International Trucks

International Harvester Co.'s motor division introduced a new line of trucks, called the B-line, ranging from 4200 to 33,000-lb gvws.

The new B-line trucks are offered in four-, six-, and all-wheel-drive chassis, with six-cylinder or V-8 engines. The line includes a new "Bonus Load" pickup body with increased cubic capacity.

Three new V-8 engines are offered

as options throughout the B-line. The V-266, rated at 154.8 hp, is available in models from 4200 to 19,000 gvws. The V-304, with 193.1-hp rating, is offered in the 16,000 to 30,000-lb range. The V-345 is optional in models from 19,000 to 33,000-lb gvws.

Standard six-cylinder engines—nine in all—have horsepower rating of from 113 to 154. Five 6's are gasoline fueled, the other four are LPG.

B-line styling features chrome-mounted dual headlights and a one-piece anodized aluminum grille described as the largest in the industry. Both Standard and Custom cabs have full five-foot wide seats. Custom cabs are offered in light, medium, and heavy-duty conventional models.

Other options throughout the line include automatic transmissions, power steering, and power brakes.

The Bonus-Load pickup body is offered in seven, and eight and one-half ft lengths, with capacities of 59.25 and 72.75 cu ft, respectively. Inside width between top flanges is 66 in., width at tailgate opening 50 in., and height 17 1/4 in.

Twin Coach Develops Pack Rat, An All-Aluminum Track Vehicle

The Twin Coach Co. disclosed the development of the "Pack Rat," a new amphibious lightweight track vehicle designed for use by the military forces and by industries operating in remote and rough terrain.

The company said two prototype models of the Pack Rat have already been completed. Made of aluminum, it has a low silhouette, turns on its own track, and is powered by a new air-cooled, aluminum engine developed by American Motors for that company's "Mighty-Mite" jeep-type vehicle.

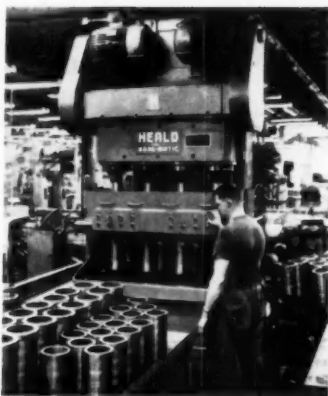
Twin Coach said the Pack Rat can be carried by helicopter and dropped by parachute. The company expects to make a public introduction of the new vehicle in the near future.

Goodrich Uses Steel Cord For Heavy-Duty Truck Tire

B. F. Goodrich Tire Co. announced it is using steel cord instead of textile to reinforce the rubber carcass of heavy-duty truck tires.

Each cord is formed of 39 high-tensile steel filaments (0.0058 in. dia) and has a minimum tensile strength of 355 lb, according to Goodrich.

E. F. Tomlinson, president, said the new tire, called "Power Express Steel Cable," gives up to 20 per cent more mileage than conventional tires. Since the steel cable cannot stretch, he pointed out, the tire will not "grow"



HEALD VERTICAL MACHINE

Largest single unit machine tools built by Heald Machine Co. are now in operation at the Columbus, Ind., plant of Cummins Engine Co. Two 40,000-lb Model S Bare-Matics are used for roughing and finishing the bores of Diesel cylinder liners—four at a time. In the Cummins installation, one machine is used for roughing and one for finishing. The two setups are identical except for tooling.

with service and can be retreaded over and over again in today's standard molds.

Tires now in production are limited to the 9.00-20, 10.00-20, and 10.00-22 sizes. Slated for production soon are sizes 8.25-20, 11.00-20, and 11.00-22.

British Car Maker Forms North American Subsidiary

Rover Co. Ltd. of England has formed a subsidiary to sell and service the Rover line of passenger cars and Land-Rover 4-wheel drive vehicles in the U.S. and Canada.

The new firm, called Rover Motor Co. of North America Ltd., will have central offices in New York City and Toronto, Canada. Parts warehouses, service, and sales headquarters have been established in New York (Long Island City), Toronto, and Vancouver. An additional sales and service center will be set up in San Francisco in the near future, the company announcement said.

Westinghouse Promotes Cresap To Chief Executive Officer

Mark W. Cresap, Jr., was elected president and chief executive officer of Westinghouse Electric Corp.

Mr. Cresap has been president of Westinghouse since Jan. 1, 1958. He succeeded Gwilym A. Price, who remained as chairman of the board.

In the present reshuffle, Mr. Price still retains the chairmanship and will remain active in an advisory and consulting capacity, the announcement said.

AI TABLOID

Corning Glass Works has developed ultrasonic delay lines with very short and extremely long delay times. The new lines, designed for military relay systems, will store a signal with minimum attenuation for periods ranging from less than 50 to more than 15,000 microsec, Corning says.

* * *

A new method of injecting carbon black into synthetic rubber latex improves the rubber's abrasion resistance qualities, says B. F. Goodrich Co. The new technique gives finer dispersion of particles throughout the rubber, resulting in greater uniformity and more resistance to tire wear.

* * *

Dayton Steel Foundry Co. has installed a new dynamometer that simulates road testing of braking systems, condensing as much as a year's research into a week. The new unit consists of a 10,000-lb flywheel to which brake drums and brake shoes are attached, and an instrument panel that controls and records the speed, temperature, and time of the test cycles.

* * *

An East German firm claims to have developed an attachment for microscopes that is capable of measuring irregularities in super-finished surfaces as minute as 0.0000001 in. The device, it is claimed, can also measure ball surface of ball bearings, as well as the walls of boreholes with a diameter of 0.2 in.

* * *

Imperial Chemical Industries Ltd., South Wales, is building the first plant in Europe devoted solely to the fabrication of wrought beryllium. The new plant will produce semi-fabricated forms of the metal, such as rod, tube, and plate.

* * *

E. F. Houghton & Co. reports successful commercial application of a new production line grease that lubricates above 1000 F. The new lubricant, called Hi-Temp 2409, is composed of an organic thickener, a synthetic carrying agent, and a solid lubricant (fine particle graphite). The carrying agent, according to Houghton, usually burns after depositing the solid lubricant, which forms a soft graphite film on bearing surfaces.

A Texas company is marketing a device called Gen-O-Drive that is designed to assure a constant battery charge for a car even when it's idling, allowing use of current-draining appliances without weakening the battery. The generator overdrive mechanism works by constantly upping generator rotation when the engine is idling or running at low speed.

* * *

A solid electrolyte battery claimed to have a shelf life of 20 years and to be capable of a greater output than a similar-size nuclear battery has been developed by Army researchers. The new battery, shaped like a cup, consists of a silver anode, a silver chloride electrolyte, and a cathode of chlorine and iodine monochloride liberated from potassium tetrachloroiodide.

* * *

Kelsey-Hayes Co. is producing a new air-brake system for cars and trucks that provides separate hydraulic units for front and rear wheels. The new system, which normally functions as a single unit, features a deceleration sensing device that automatically reduces power of rear brakes so that they are shut down just short of the skid point. In case of failure of one of the hydraulic units, the other would bring the vehicle safely to a stop.

* * *

Sun Oil Co. is building a Product Control Center at its Marcus Hook (Pa.) refinery to collect plant operating data and monitor continuously petroleum product streams. The new facility, believed to be the first of its kind, will provide data to enable plant operators to make changes in small increments and to better hold products to specifications.

* * *

Urethane elastomer parts weighing from 4 ounces up to 96 lb have been cast successfully on a new type of production machine designed by Mobay Chemical Co. The new continuous casting machine, which does away with hand mixing of chemicals used in the process, is the first mass production unit designed for American production techniques and materials, Mobay says.

AVIATION MANUFACTURING



First large part ever forged from beryllium is removed from 18,000-ton press at Wyman-Gordon plant.

Beryllium Forged Successfully By New Wyman-Gordon Process

Wyman-Gordon Co. announced it has succeeded in producing large structural shapes of beryllium by a new closed-die forging process.

Robert W. Stoddard, president, said the new technique eliminates the one critical impediment to the use of beryllium in rockets and aircraft—its brittleness.

The new method is capable of producing large structural shapes that require a minimum of machining and have the ductility of strong aluminum alloys while at the same time retaining all the inherently desirable properties of beryllium, Mr. Stoddard stated.

Among these properties: it's almost as light as magnesium, yet it has a modulus of elasticity about one and one-half times that of steel; it behaves well in certain nuclear environments; and it has a high heat capacity.

Mr. Stoddard said the new method not only improves the metal's ductility but also solves the problem of production.

"Previously, smaller parts have been machined from rough blocks produced under little or no pressure and subjected to high temperatures

for many hours and, in many cases, even days," he said. The new Wyman-Gordon forging method, he pointed out, "produces a part in a matter of seconds—at most minutes—and therefore gives a production capability, as far as quantities are concerned, comparable with other metals."

The new forging process was developed at a North Grafton, Mass., facility operated for the Air Force by Wyman-Gordon. The beryllium forging was produced on an 18,000-ton closed-die forging press that has been in operation at the plant since 1946. Since then, the Air Force has installed a 35,000-ton press and another of more than 50,000 tons. The latter is said to be the largest single industrial machine ever designed and built.

Convair to Design Airframe For Nuclear-Powered Plane

The Air Force announced it has selected Convair (Fort Worth) Div. of General Dynamics Corp. to work with General Electric Co.'s Nuclear Propulsion Div. in the design of a nuclear-powered bomber.

General Dynamics won out over Lockheed Aircraft Corp. in an Air

Force design study competition for an airframe for the proposed nuclear-powered aircraft.

The Air Force said that for the time being most work on the nuclear plane will be concentrated on the propulsion system. For this reason, the Pentagon stated, better results can be obtained if a single airframe builder "works directly with the propulsion contractor in carrying out the design from this point on."

The Air Force said, however, that it will continue to support Lockheed research on the effects of radiation on nuclear powered aircraft.

GE to Develop 2nd Stage Engine for Project Vega

The National Aeronautics and Space Administration has awarded General Electric Co. a \$5 million contract to develop a liquid-fuel engine to power the second stage of the Project Vega vehicle.

The Vega will combine the GE engine—a modified Vanguard first-stage powerplant—and an Atlas missile as the first stage. Vega will be capable of carrying large satellites into interplanetary flight.

The new contract, NASA noted, also calls for development of an ignition system to start and restart the engine in space.

Work on the new engine will be done at GE's Evendale, O., plant and at the Malta Test Station, near Schenectady, N. Y.

Martin "Hula Head" Improves Honeycomb Machining Process

Machining of honeycomb structures for aircraft and missiles has been made easier by a machine cutter head that moves like a Hawaiian Hula dancer.

The new device, known as "Hula-Head," is used together with a modified stylus to convert a standard 3-axis cutting machine to a 5-axis unit.

The new technique, developed by Martin Co., is said to be the first of its kind capable of working within required tolerances and finish without the use of a filler substance to rigidize the sandwich core during machining.

During cutting the stylus, which



A new way of machining honeycomb structures, developed by Martin Co., involves a standard three-axis controlled cutting machine equipped with the new "Hula Head" and a modified stylus. The stylus with five pick-up points converts the 3-axis cutting machine to a 5-axis motion. Stylus (left) rides the surface of a wooden or plaster contoured model and transmits rise, fall, and tilt motions to the cutter head (right), which is performing concave operation here.

has five pick-up points, rides the surface of a wooden or plaster contoured model and transmits rise, fall, and tilt motions to the cutter head. The knife edge on the cutter head duplicates the stylus motions to cut the honeycomb core.

The cutter head can tilt plus or minus ten degrees in two directions, perpendicular to each other, according to Martin. Tracer controls consist of a combination of pneumatic, hydraulic, and electronic components. Power is supplied by an air motor developing 12,000 rpm.

Martin officials said the Hula Head has turned out both "male" and "female" compound contour honeycomb sections. The device was invented by Carlton Jenks, a Martin research engineer, and announced at the recent SAE national aeronautical meeting in New York.

Grumman Gets \$107 Million Navy "Incentive" Contract

Grumman Aircraft Engineering Corp. received a \$10.7 million contract to develop and produce a new Navy jet attack plane, the A2F-1.

The new award follows announcement of a \$93 million contract to Grumman for a new Navy early warning, the W2F-1.

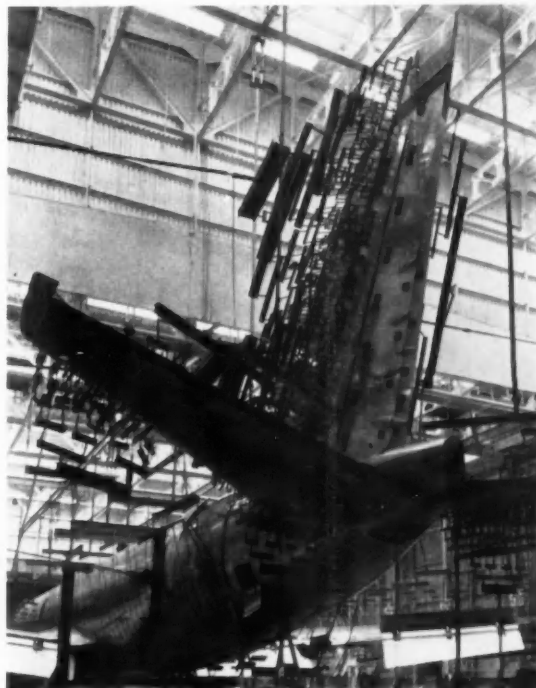
The Navy said the new award is the first to be made under its new "cost-plus-incentive-fee" system, which bases the contractor's profit on the aircraft's performance as well as on his control of costs.

Fred A. Bantz, assistant Secretary of the Navy for Materiel, said that

both the Navy and Grumman stand to gain from such an incentive system. "If specific performance objectives are exceeded and costs well controlled," Bantz said, "the Navy will receive an advanced aircraft more quickly than in the past, and at a lower price. Grumman, in turn, will receive additional profit dollars for its concentrated engineering and management effort."

STATIC TEST

This Convair 880 jet liner is subjected to bending, twisting and pulling to simulate the forces it will encounter in flight. In the test setup shown here the fuselage is pressurized to above-operating levels and a force of 16 tons exerted against the vertical tail surface. This force is distributed over the plane's structure by an ingenious arrangement of whiffletrees fixed to the skin surfaces. This test simulates the stress of an extremely sharp turn in flight. The entire test program lasting nine months is being done at the Structures Test Laboratories at Convair (San Diego) Div. of General Dynamics Corp.



The reverse applies, of course, if either the aircraft's performance or costs are "below the norm which the two parties have agreed upon as being reasonable," Bantz added.

Standard development contracts are based on a cost-plus-fixed-fee system, under which the contractor's profit is the same whether costs run over or under the contract estimate.

The A2F-1, a carrier-based aircraft designed for high- and low-altitude operation, will be powered by two turbojet engines and manned by a crew of two. Further design and performance details are classified.

The contract for the W2F-1 early-warning plane includes a \$24 million pre-production award for initial development work.

The W2F-1, which is still unnamed, will be powered by two Allison prop-jet engines.

Aerojet to Develop 3 Stages Of Solid-Fuel Minuteman ICBM

The Air Force awarded Aerojet-General Corp. an \$85 million contract to develop all three stages of the solid-fuel Minuteman ICBM.

Work on the Minuteman already was under way at Aerojet's Sacramento, Calif., plant, under a letter of authority previously issued.

Richard D. Geckler, vice-president, Solid Rocket Plant, said the present Minuteman work force numbering 870 will be expanded rapidly in the next few months.

MEIN

IN THE NEWS



Universal - Cyclops Steel Corp.—Fred A. Kaufman was named vice-president and general manager.

U. S. Steel Corp., American Steel and Wire Div.—**Harry M. Francis** was named executive vice-president, and **Edward A. Murray** succeeds him as vice-president, sales.

Sperry Products, Inc.—**Richard Y. Neiley** was appointed assistant industrial sales manager.

General Motors Corp., Fisher Body Div.—**Walter E. Mitchell** was named director of Paint Standards Activity and **Harry L. Emerson** production manager of the Pontiac plant.

Allegheny Ludlum Steel Corp., Forgings and Castings Div.—**Lewis B. Polen** has been appointed manufacturing manager of the Buffalo (N.Y.) and Ferndale (Mich.) plants.

Raytheon Mfg. Co. — **Richard E. Krafve**, former Ford Motor Co. vice-president, was elected group vice-president, commercial.

Universal-Cyclops Steel Corp., Re-fractomet Div.—**Peter C. Rossin** has been named general manager.

Arvey Corp.—**T. R. Simpkins** was made director of research and product development.

Bendix Aviation Corp., Products Div.—**Ralph G. Caouette** was named general manager of the automotive section.



Norton Co.—Warren L. Hardy is now manager of marketing research for abrasive products.



Copperweld Steel Co., Superior Steel Div.—Luther F. Taylor was promoted to manager of sales development and Samuel H. Cole to manager of stainless steel sales.

Koehring Co., Buffalo-Springfield Div.—**R. E. Burton** has been promoted to president and general manager.

Armstrong Cork Co. International Marketing Div. — **Richard C. Stork** was named assistant general manager; **Jay H. Hershey**, manager of packaging and industrial specialties; and **Ralph B. Singer**, international traffic manager.

General Electric Co., Chemical & Metallurgical Div.—**E. M. Irish, Jr.**, has been appointed product manager for the phenolics line; **A. J. Bzdula**, field sales manager for the Chemical Materials Dept.; and **W. F. Christopher**, polycarbonate market development manager.

ACF Industries, Carter Carburetor Div.—**L. V. Martikonis** has been appointed sales promotion manager.

Chrysler Corp. — **William M. Schmidt** resigned as executive stylist.

Raybestos-Manhattan, Inc., Manhattan Rubber Div.—**Joseph N. Kuzmick** has become divisional manager; **Clarence P. Schneider**, assistant to the divisional manager; and **Robert J. Gorecki** and **Wilder E. Perkins**, manufacturing general managers.



Chrysler Corp., Amplex Div.—William L. Martin has been named sales manager.

Westinghouse Air Brake Co., Le Roi Div.—**Richard H. Koehler** was appointed general sales manager.

Taylor Fibre Co.—**Paul V. Brown** was made manager-manufacturing of the La Verne (Calif.) plant.

Vickers Inc.—**A. M. Lane** has been appointed commercial markets development manager and **Jacques Carpenter** district manager of the Detroit Industrial Sales Office.

Westinghouse Electric Corp.—**K. M. Patterson** has been made manager of headquarters sales departments for the apparatus division, and **C. E. Hammond** succeeds him as manager of the division's industrial sales department.

Necrology

Paul W. Litchfield, 83, honorary chairman of the board of Goodyear Tire & Rubber Co. since retirement last October, died March 18, at Phoenix, Ariz.

C. O. Wanvig, 68, chairman of the board of Globe-Union, Inc., died March 18.

Alfred G. Gibbons, 78, chairman of the board of National Rivet & Mfg. Co. and Shaler Co., died March 18, at Wauwatosa, Wis.

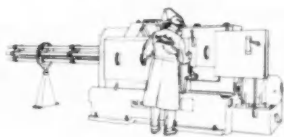
Frederick M. Hatch, retired president and general manager of Stanley Works of Canada, died March 21, at Nassau, Bahamas.

Paul D. Wood, 62, director of industrial relations for Alan Wood Steel Co., died recently, at Norristown, Pa.

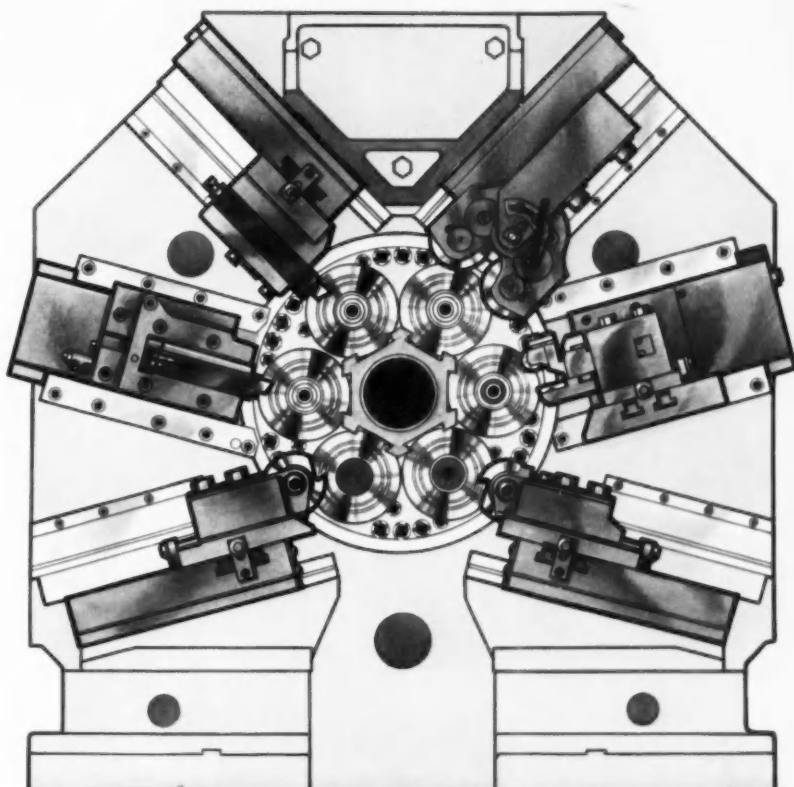


Bendix Aviation Corp., Products Div.—Ralph G. Caouette was appointed general manager of the automotive section.

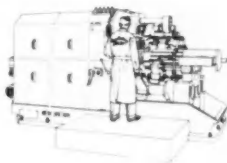
Look at New Britain's
**new cross slide
 arrangement**



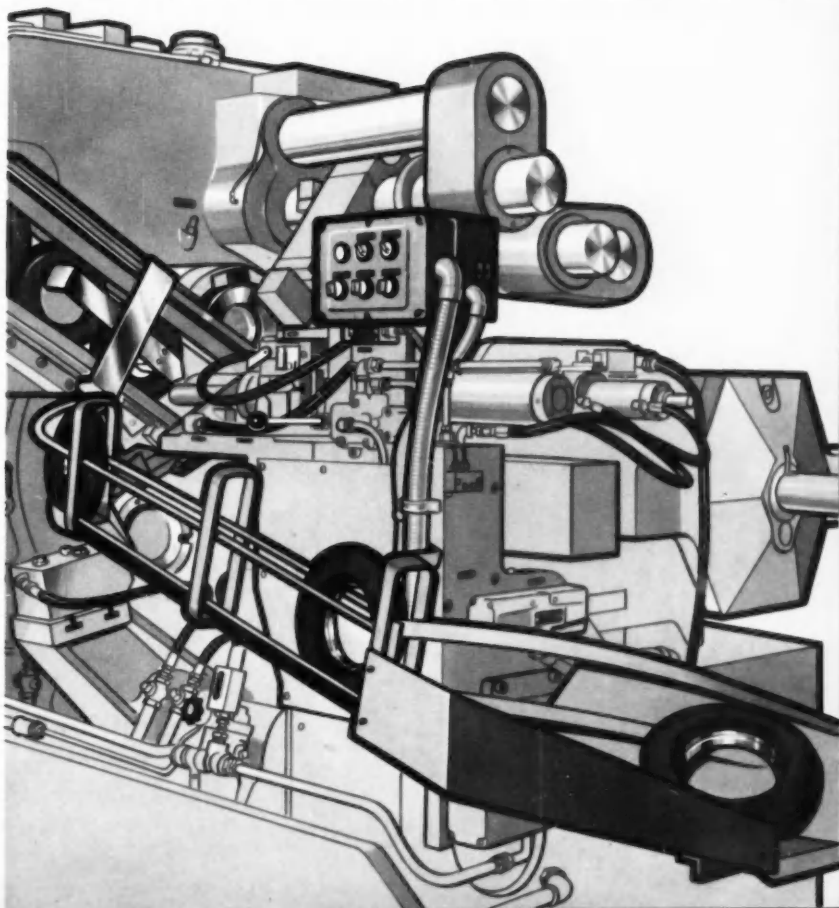
Independent radial cross slides in *all* positions, providing maximum clearance for more cross slide operations.

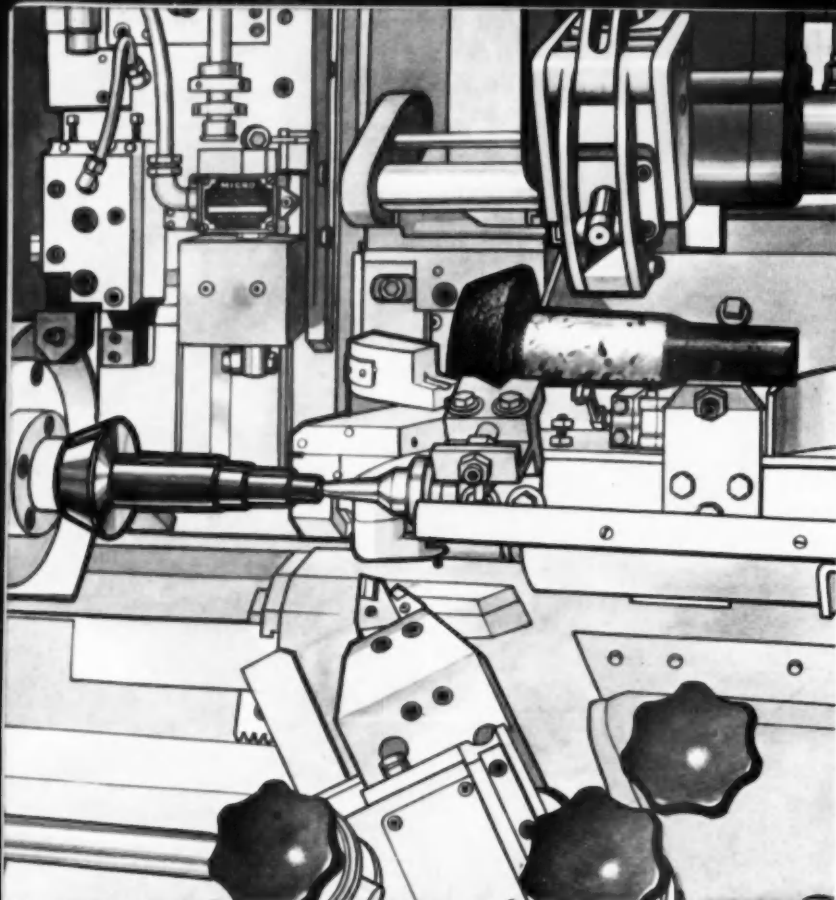


Look at New Britain's
**open-end
 chucker design**



Greater accessibility for all applications and particularly well adapted to automatic handling of pieces. New Britain-Gridley Machine Division, The New Britain Machine Company, New Britain, Connecticut.

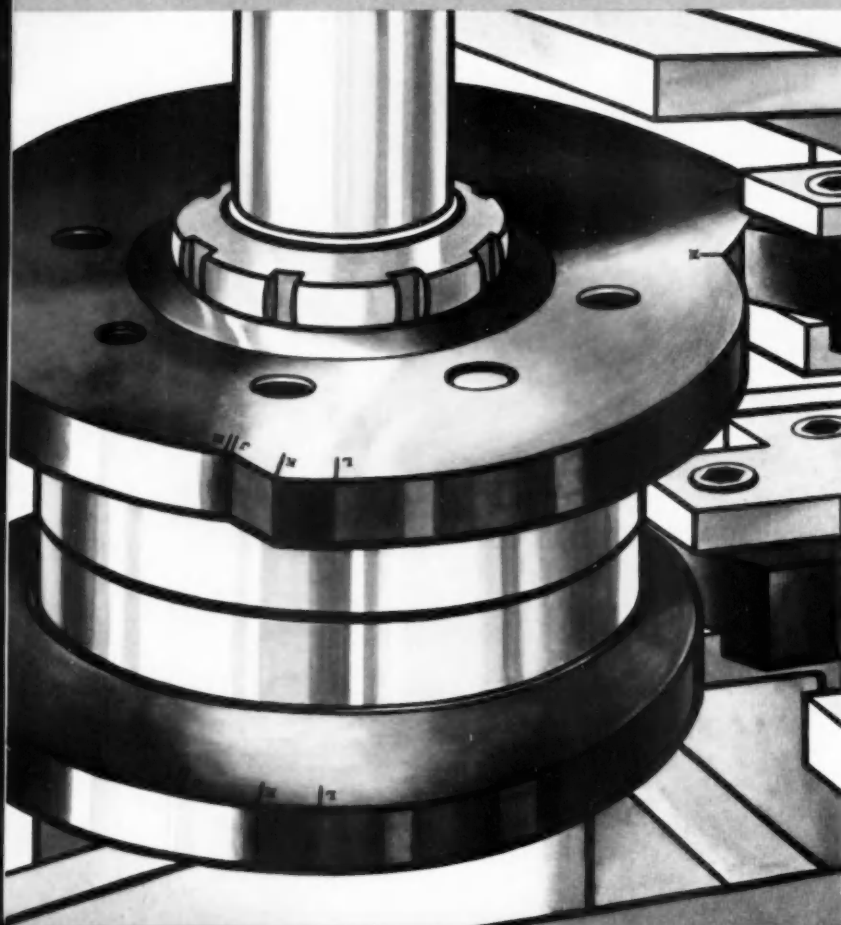




Look at
Automatic Loading on
New Britain +GF+



This basic optional feature can make money for you whether you are working with forgings, bar slugs, or bar stock.



Look at New Britain's
cam-controlled
boring machine



When you are working to tenths there is no substitute for the positive tool control that only precision cams provide. New Britain-Gridley Machine Division, The New Britain Machine Company, New Britain, Connecticut.



When **CONTROL** cannot be a question of degree . . .

Exacting engine control believed impossible only a few years ago is now the expected, not only in modern aircraft and missiles, but also in today's automobiles and trucks. And, this absolute accuracy is demanded under temperature, pressure, and power conditions found, until recently, only in laboratories. Temperature variations alone of -80°F to $+160^{\circ}\text{F}$ require almost continuous compensations in today's jet aircraft and

missiles. More, these ever-increasing requirements must be designed for ever-decreasing standards of size and weight.

For more than a half-century, Holley has pioneered such developments as: lower automotive hood lines through smaller carburetors and fuel control systems for jet engines that save one-third the weight, one-fourth the space. That's why two generations of Americans on the move have come to depend on Holley products.

Circle 122 on Inquiry Card, for more data

*For more information about
Holley products, automotive or
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WARREN, MICH.

I-30

FOR MORE THAN HALF-A-CENTURY . . .
ORIGINAL EQUIPMENT MANUFACTURERS FOR
THE AUTOMOTIVE AND AIRCRAFT INDUSTRIES

The Ingersoll Milling Machine Company

Special Machine Tools

Rockford, Illinois

EDSON I. SATLORD
General Manager

December 15, 1958

Mr. Everett Hicks
Vice Pres. and General Mgr.
Grinding Machine Division
Norton Company
Worcester 6, Mass.

Dear Everett:

We have just run one of the spindle and drive bar sleeves on our new Norton 18 x 96" Type LC-2 Plain Cylindrical Grinding Machine and I thought you would be interested in the results.

You estimated that this machine would do all the grinding and handling, except loading and unloading, in 350 minutes. Our actual grinding and handling time was 352.4 minutes.

This indicates that your estimates are thoroughly dependable and we look forward to beating them as we become better acquainted with the machine's operation.

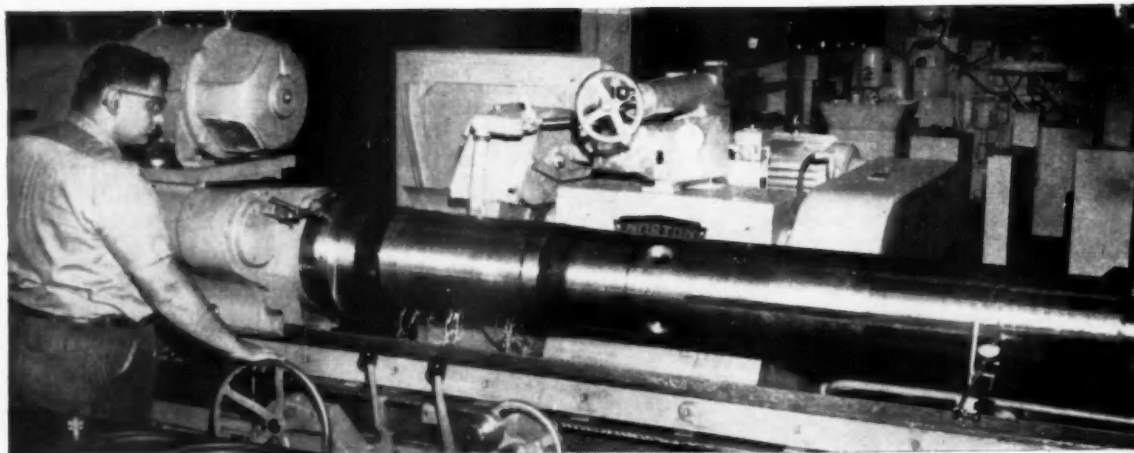
The last time we checked the performance of our Norton 10 x 48" Semi-Automatic Cylindrical Grinding Machine it showed a 46% time saving, compared with your estimate of 39%.

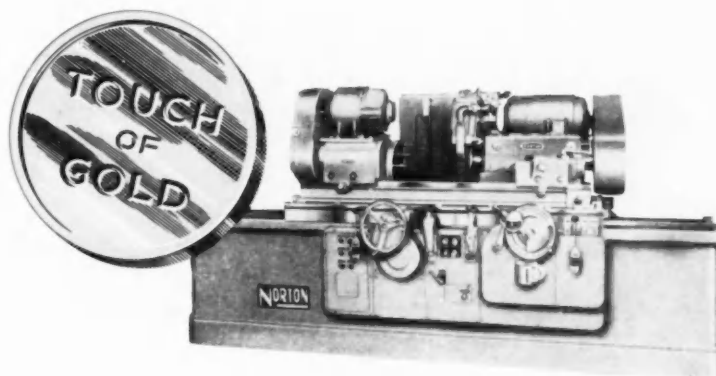
Time estimates like these are a great help. In fact, they are necessary to us, in implementing our equipment replacement policy.

Sincerely,

Edson

Ingersoll reports how Norton Cylindrical Grinders save





As Mr. Gaylord, the Ingersoll Milling Machine Company's General Manager, points out, Norton machines will give you increased production.

This increased production is just one of the proved "Touch of Gold" advantages of Norton grinding machines. Others are precise sizing control, low maintenance and long, continuous service life. These are designed into each machine.

Norton Cylindrical Grinders have swing capacities ranging from 4" to 24" and work lengths from 18" to 168". All are available as Plain Machines or Semiautomatics. All have controls for feeds and speeds grouped at the operating position, with key maintenance points located outside. And all are engineered for adaptability to meet changing production requirements, and for durability to keep on delivering economy under the toughest conditions of use.

Call in your Norton Sales Engineer, a well trained, long experienced specialist in grinding. He'll gladly give you an accurate estimate of what Norton grinding machines can do for you. NORTON COMPANY, Machine Division, Worcester 6, Mass. District Offices: Worcester, Hartford, Cleveland, Chicago, Detroit. In Canada: J. H. Ryder Machinery Co., Ltd., Toronto 5.

as predicted

Photos show the types of cylindrical grinders used and described by the Ingersoll Company. Photo at upper right is a Norton 10" x 48" Type CTU; photo at left was taken in the Ingersoll plant, and shows their Norton 18" x 96" Type LC-2.



GRINDERS and LAPPERS

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...to make your products better**

NORTON PRODUCTS Abrasives • Grinding Wheels • Grinding Machines • Refractories • Electrochemicals — **BEHRMANNING DIVISION** Coated Abrasives • Sharpening Stones • Pressure Sensitive Tapes

Do your air brake systems provide ample air?



Wagner ROTARY COMPRESSOR

**delivers ample air at all times
for safe operation of brakes**

Your customers have a continuous, dependable source of air for the operation of brakes and other air powered devices when you equip your vehicles with high volume, efficient Wagner Rotary Air Compressors.

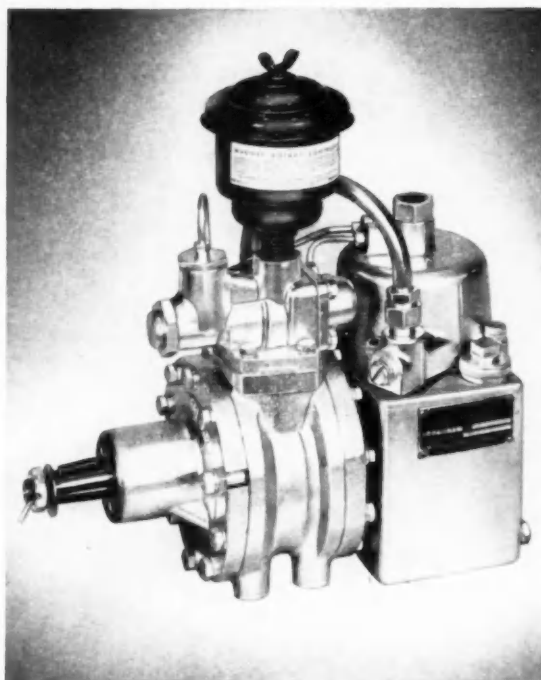
With either 9 or 12 c. f. m. Wagner Rotary Air Compressors you provide these additional performance features:

LONG COMPRESSOR LIFE—All rotating parts are turned by the shaft, suspended on two bearing surfaces. This results in less friction—adds to compressor life.

FAST RECOVERY OF PRESSURE—Rotary compression forces all air from the compression chambers. Such high volumetric efficiency means rapid air pressure recovery at all compressor speeds.

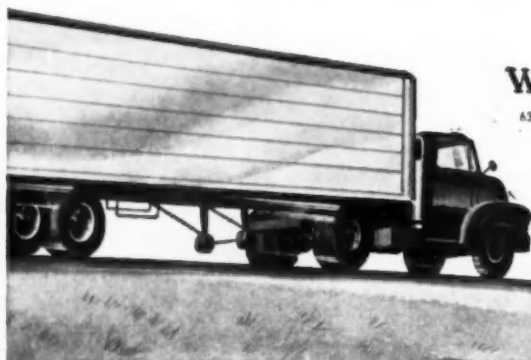
LOW TEMPERATURE AIR DELIVERY—Oil is separated and cooled *before* air is discharged from the compressor. This prevents carbon formation—reduces fire hazard—permits use of flexible air hose in discharge line.

SMOOTH, QUIET OPERATION—Thousands of small overlapping air compression impulses per minute maintain a uniform load and assure smooth, quiet operation with long belt life.



GET ALL THE FACTS on the Rotary Air Compressor and details on complete Wagner Air Brake Systems and Equipment for trucks, tractors, trailers, buses and off-the-road equipment...ask for Catalog KU-201.

WKS-7A



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Technical data for gasket design and selection

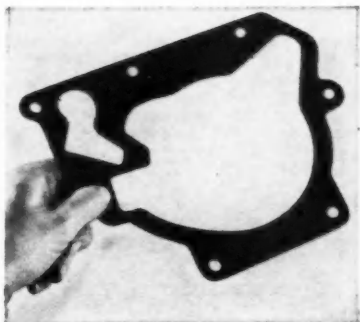
Choosing a gasket for aluminum flanges

The use of aluminum flanges—particularly temperatures of 300° F. or above—creates some new problems in gasket engineering.

As heat is applied to an aluminum assembly, expansion has the effect of substantially increasing the unit load above that usually attained by the initial torquing operation. This higher load usually causes conventional fiber materials to crush and extrude, resulting in serious loss of bolt torque.

Effective sealing under such conditions requires a dense material with unusual resistance to crushing at high temperatures. A material that meets these requirements is Accopac AN-890, a new Armstrong asbestos gasket.

Under test loads of 100,000 psi at temperatures of 350° F., AN-890 shows no noticeable extrusion or crushing. Indications are that the ex-



cellent torque retention properties of AN-890 would not be impaired even at much higher temperatures.

AN-890 is made by a beater-saturation process pioneered and patented by Armstrong. This method coats the fibers uniformly with a nitrile-type latex rubber binder and links them so tightly that crushing and extrusion are eliminated in normal applications.

With all its advantages, AN-890 costs less than conventional compressed asbestos sheet materials. For more information, send for a copy of bulletin IND-915.

AUTOMOTIVE INDUSTRIES, April 15, 1959

How thickness affects performance of cork-and-rubber and rubber gaskets

Where cork-and-rubber or straight rubber gaskets are used, it should not be assumed that greater sealability will be achieved merely by increasing

were a factor in almost every case of excessive torque loss.

Flange Alignment. Cocking, flange misalignment, and non-parallelism are

LB./SQ. IN.	2,000	4,000	6,000	8,000	10,000	12,000	16,000	20,000	24,000	28,000	30,000
MATERIAL											
1/8"	●	●	●								
1/16"	●	●	●	●	●	●					
1/32"	●	●	●	●	●	●	●	●	●	●	●

Results of a hot extrusion test on a cork-and-rubber gasket material. Tests were conducted at 200° F., with thickness the only difference between the samples.

the thickness of the gasket. Actually, it is possible for a too-thick gasket to have just the opposite effect.

Armstrong research engineers point out a number of disadvantages that may be encountered when gaskets are thicker than they need be.

The first of these is obviously economic. Since a thick gasket costs more than a thin one, using a thicker gauge than needed is obviously a waste of money. In addition, such a gasket may cause trouble in three major ways: (1) by extruding and crushing; (2) by allowing excessive torque loss, and (3) by encouraging flange misalignment.

Extrusion. The tendency for a rubber or rubber-like gasket to crush or extrude increases as the gauge increases, as shown in the chart above. Note that the 1/8" sample crushes at 6,000 psi, while it takes 30,000 psi to crush the same material in 1/32" gauge.

Torque Loss. Although some torque loss occurs with any non-metallic gasket material, a too-thick gasket will almost always aggravate the problem. As a result, leaks occur or frequent re-torquing of bolts becomes necessary. In laboratory checks at the Armstrong Research and Development Center, it was found that over-gauge gaskets

most commonly caused by the failure to follow a standard torquing sequence. This often happens in maintenance work, such as replacement of pipe flange gaskets.

The risk of misalignment increases if a gasket is thicker than it needs to be. This is because, with rubber or rubber-like gaskets, the thicker the gasket, the greater the flange load needed to create a seal. And the danger of misalignment increases as the flange load goes up.

Thus, the gauge of a gasket is an important factor in gasket selection and must be considered carefully. Generally speaking, the thinnest gasket that can be tolerated is suggested. Where necessary, it might be advisable to test various thicknesses.

We will be glad to give suggestions on your specific problems if you will send details to us.

For your copy of the Armstrong Gasket Design Manual, write to Armstrong Cork Company, Industrial Div., 7004 Imperial Avenue, Lancaster, Pa.



Armstrong GASKET MATERIALS

... used wherever performance counts

Circle 124 on Inquiry Card, for more data

35

FAMILIAR ways of machining the universal joint cross have finally given way to a simpler and more advanced technique developed by Chrysler's Detroit Universal Div., Dearborn, Mich. Basically the new setup entails just about five major operations, one of these being heat treatment.

Principal dimensions of the product are shown in Fig. 1. Note that the ground diameters are held to a total tolerance of 0.0005 in. Surface finish is held within 10 to 12-microinch (rms), this being checked on a sampling basis. Final operation—surface grinding of the ends to length is held to a total tolerance of 0.001 in.

Discarding the conventional method of hollow-milling the bearing ends, the first operation on the forging is that of drilling, facing, centering, and chamfering the bearing ends in a Charles Martin three-station transfer machine, fitted with 12 Hause Holomatic heads. These heads are mounted in clusters of four to each station so as to complete the four end holes in each cycle.

Advanced Machining Techniques for Chrysler Universal Joints

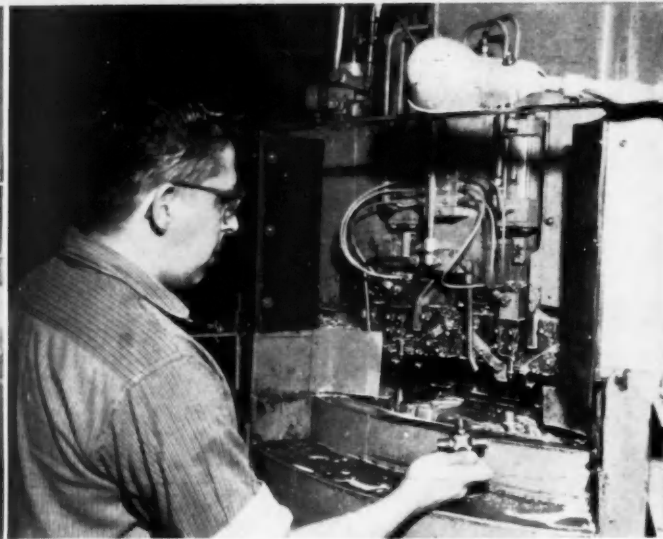
As illustrated, the forgings are fed to the first station from a Feedall hopper which is fitted with a Syntrol for orienting and feeding the chute mechanism to the first station. The chute has an automatic gaging device designed to reject any oversized forgings. Movement to the part from one station to another is handled by means of a transfer bar. Noteworthy feature of the Holomatic heads is that they are all interchangeable and can be readily replaced.

The second operation takes place in a new version of the familiar Hoern & Dilts (New Britain) ma-

chine of 10-station type for turning the diameters and generating the oil seal shoulder. Each station has a rough- and finish-turning tool—a triangular-shaped throw-away carbide tip. The forging is held in an indexing chuck which presents each of the four bearing ends successively in a vertical position. Generating of the configuration of the shoulder is done by means of a cam-operated tracer. Significant feature here is that turning of the shoulder is produced with such a fine surface finish that grinding is no longer necessary. Moreover, the generated surface is

View of portion of Charles Martin three-station machine for drilling, facing, centering, and chamfering the four bearing ends of the cross. At the left is the Feedall hopper as well as the Syntrol for feeding and orienting parts to the first station. The chute has an automatic gaging device designed to eject any oversized forgings. Movement of the part is handled by means of a transfer bar.

Close-up of work station of the Hoern & Dilts machine for turning the bearing diameters and generating the oil seal shoulder. Of 10-station type, each station is fitted with a rough- and finish-turning tool of throwaway type. Note that forgings are held in the chuck with one bearing in vertical position. The chuck indexes the cross to present each of the four bearings successively.



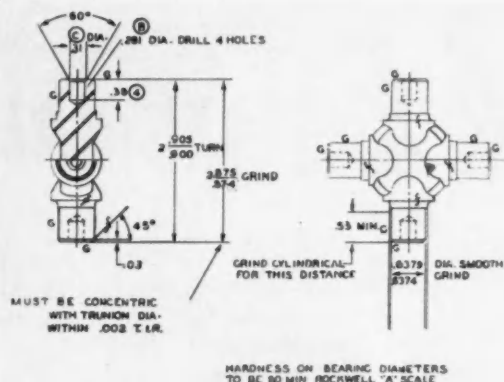


FIG. 1
Chrysler's universal joint cross

singularly free from tool marks.

Following turning in the Hoern & Dilts machine the forgings go to heat treat for carburizing, hardening and drawing. Then they are returned to the machine area for finish-grinding.

The first two operations each have a productivity of 450 pieces an hour at 100 per cent efficiency. To match this productivity Chrys-

ler has installed two of the latest type Van Norman centerless grinders for finish grinding bearing ends.

As illustrated, these grinders are equipped with an overhead-mounted crush type wheel dresser which is operated manually as required. This method is said to produce an absolutely smooth grinding wheel surface which, in turn, is responsible for a superior sur-

face finish on the work, free from wheel marks.

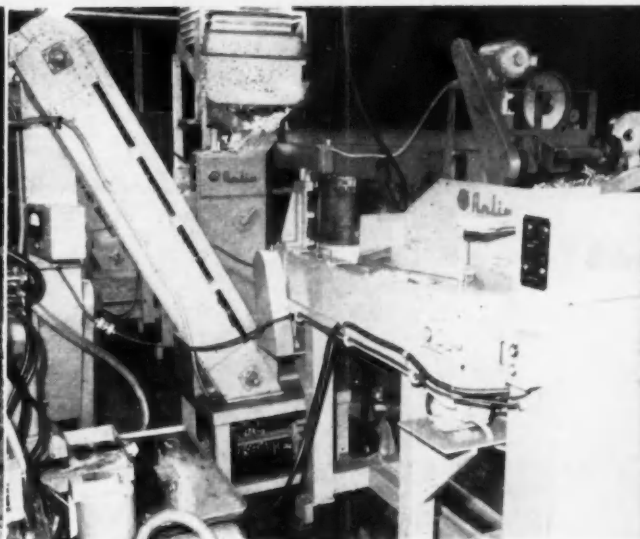
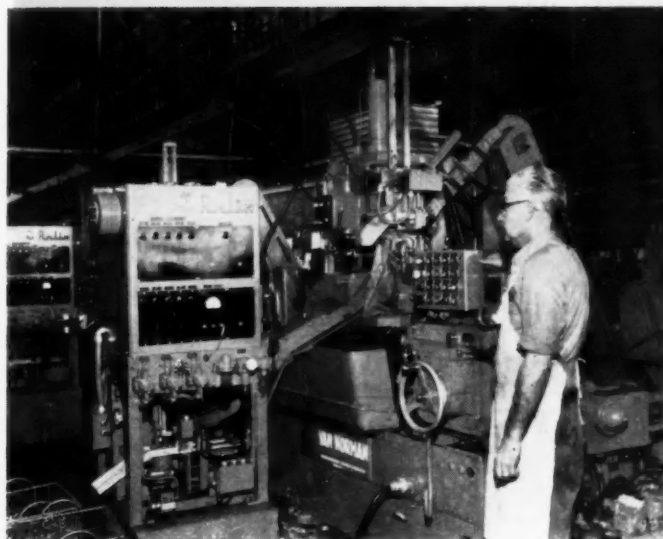
Both grinders are fed from a single hopper with an RCA-Arlin distribution conveyor for feeding parts to each grinder on demand. Each grinder in turn has an Arlin brain unit for controlling the flow of parts into the loading mechanism. This mechanism takes care of orienting as well as feeding.

Another noteworthy feature of the Van Norman grinders is the automatic cycling of the vertical slide, designed to unload a finished part with each stroke. On the up-stroke it accepts one rough forging; discharges a finished part; indexes one ground part. On the down-stroke, in grinding position, it grinds four diameters in one place in one setting.

As mentioned earlier, grinding is held to a total tolerance of 0.0005 in. on diameter, while maximum taper is held to 0.0002 in. A sampling inspection is made by the operator, using the familiar Sheffield column type air gage. For best results the grinders employ Vacmul oil as a coolant. ■

Following heat treatment the parts are processed through the two Van Norman centerless grinders. The vertical slide which is responsible for much of the automation associated with feeding, orienting, and unloading of parts may be seen in up-position near the right. At the left is the Arlin automatic gaging unit employed for final inspection of dimensional tolerances of the workpieces.

This is the RCA Arlin automation equipment for feeding parts to the Van Norman grinders. In the background is the large hopper from which parts enter the Arlin system, transporting parts to both machines. The Arlin unit orients the parts; then feeds them on demand to the elevator serving the grinder. This elevator, as well as the feeding chute, may be seen at the extreme right of the grinder.



NATIONAL automobile week in Detroit March 16-20, marked the combined sessions of the SAE National Passenger Car and Production Meeting, together with sessions sponsored by the Body and Materials divisions.

Gathering interest in small cars doubtless was responsible for the heavily attended session on light cars—Hillman, Goliath, and the Lark. It is noteworthy that recent economic and psychological pressures have turned projected small car designs in the direction of European practice which has persisted without much change during a period when US cars were going through an amazing metamorphosis.

Another large group gathered for the session on electronic techniques for testing passenger car bodies. A display of instrumentation currently in use received unusual attention. The new methods with the aid of electronic computers make it possible to examine every major area of the body structure and analyze it quickly for necessary changes or improvements in structural design.

Other sessions were held to deal with problems of indoor testing with controlled environment for extremes of temperature, sound and vibration; on components affecting ride and handling of cars; on the new automobile finishes that have taken the industry by storm. These are the finishes that will retain their hue and luster for long periods of time, some without resort to initial waxing.

Significant too was discussion of exhaust systems and mufflers. A great deal of improvement has been effected recently by the use of zinc coated sheet and aluminum clad steels. Still more improvement is needed if the life of exhaust systems is to be extended in the light of the extremely high replacement costs prevalent today, particularly in the case of dual exhaust systems.

The last two days of the meeting were devoted to production problems. Morning sessions on each day included four simultaneous panels on selected subjects. Afternoon sessions featured two simultaneous meetings each day with

prepared papers which have been covered in abstract form below.

Cast Iron and Steel Dies

Cast-to-size dies were described by P. H. Clapp, Jr., of American Brake Shoe, as holding considerable promise in reducing the cost of die equipment, reducing lead time, and eliminating most machining and finishing operations. His company has been engaged in this technique for some time and although there are still problems, such as warpage for example, improvements are being effected constantly through research. Cast-to-size dies can be produced true to the desired configuration and to close dimensional tolerances with excellent surface finish.

One of the major advantages of current work in this connection is the use of electric furnace melting for alloy iron and steel compositions. The metal is free from shrink effects, has a denser structure, and resists abrasion.

Electronic Discharge Machining

Features of electronic discharge machining (EDM) of dies were discussed by J. S. Larkins, Jr., Elox Corp. Over \$12-million of Elox equipment is now in use in industry. EDM is growing in acceptance for the machining of sheet metal dies, equipment of 5000-amp capacity being available today for fast metal removal. Among current applications of EDM, Larkins mentioned blanking and multiple-piercing dies; cold heading dies; cavity dies; dies for missile parts. In particular, EDM is uniquely suited for machining the exotic and otherwise hard-to-machine metals and alloys. One of the big advantages in producing die sets comes from the ability of

using the finished punch as the EDM tool. Thus it produces its own fine fit with the die.

Economics of Press Tooling

From Chevrolet Stamping came some noteworthy comments on the economics of press tooling. At Chevrolet they maintain intimate contact between the stamping plant management and stylists and designers to make sure that sheet metal design can be produced economically in mass production. It starts with analysis of product design in its initial stages. According to Chevrolet management the best tools are those that are the simplest in design. Among the rule-of-thumb things to watch are such things as avoidance of complicated contours, avoidance of multiple piece construction, and an aim for the simplest joining methods.

Major forward step in the economics of body production is found in the current trend to a maximum interchangeability of body parts, among different models, making possible the use of interchangeable dies and employment of inserts. In discussing this phase of the subject, C. C. Mezey, Chrysler Corp., urged more attention to press automation methods, indicating the need for greater economy and simplification of mechanism. He also recommended that press manufacturers give consideration in their forward planning to presses which can be equipped with air cushions both top and bottom.

Scheduling and Inventory Control

How to conserve capital through better scheduling and inventory control was the general subject of one of the panels. Electronic data processing methods now provide a

SAE NATIONAL

AUTOMOBILE WEEK ..

By
Joseph Geschelin

key to flexible inventory control in the face of changing schedules. It has become exceedingly difficult to analyze and screen all orders for zones and regions in motor car assembly, due to the time factor. Electronic data processing makes it possible to analyze the flow of dealer and customer orders quickly, compare them against established schedules and compute new requirements so to adjust material flow at the source. Often it is found that established schedules are in line on a national level but with respect to assembly plant locations. This requires adjustment of material flow by the assembly plant without changing source production schedules. Electronic data processing equipment can be employed effectively in updating such schedules quickly and efficiently.

The magnitude of selections and variations in options for passenger cars has become a major problem in scheduling in recent years. The solution is not simple and is of considerable concern to all management. The root of the problem is the conflict between giving the customer what he wants and the problem of costly inventories. Any improvement in making adequate forecasts would result in reducing the fluctuation of customer requirements to a minimum. On the other hand, any further fluctuations in requirements must be met either by increasing available inventories or in additional open facilities.

Conservation of Floor Space

What can be done to conserve valuable floor space is a matter

that occupied the attention of one of the panels. An interesting case study was presented by Plymouth. A few years ago the Plymouth plant was converted to serve as a body and assembly operation. On the basis of 1000 cars a day they were short some 200,000 sq ft of floor space with no possibility of making an addition due to lack of yard space. Moreover, the plant is a one-story building and neither the footings nor the steel work could take a normal second story addition.

Analysis showed that a considerable amount of floor space was tied up in paint drying ovens. Since the weight of these ovens was small, it was decided to locate them on the roof where they would not take up valuable floor space, besides which the problem of heat radiation would be eliminated. By installing the ovens on the roof, Plymouth was able to house them in an area of about 200,000 sq ft. Moreover, the cost of this move was quite nominal, actually less than 10 per cent of the cost of a building addition.

Another plus advantage of this installation was that the ovens were installed while the assembly lines below continued in operation without interruption.

H. L. Roat of AC Spark Plug talked about the conservation of floor space in terms of material handling. Here they have mapped four major areas of space saving. Direct integration is defined as an area in which the fabricating facility is so situated that finished parts are fed into the assembled product without the use of stock containers, trucking, manual handling, or even the use of a conveyor.

Indirect integration is a situation where the fabricated part is completed in one area and is de-

livered to the assembly area by conveyor means which serves both for transportation as well as storage.

Selection of Conveyors

The third area is in the selection of the proper types of conveyors as well as their placement and location. For example, power-and-free conveyors permit fabrication or sub-assembly work to be stored and then moved to the ceiling area. Parts then can be delivered to the point of usage without interfering with operations located underneath the conveyor installation. Magnetic lift conveyors have simplified the problem of moving parts up and overhead. Besides these examples, it is always important to consider the possibility of locating certain kinds of conveyors beneath the floor to conserve space.

Location of Facilities

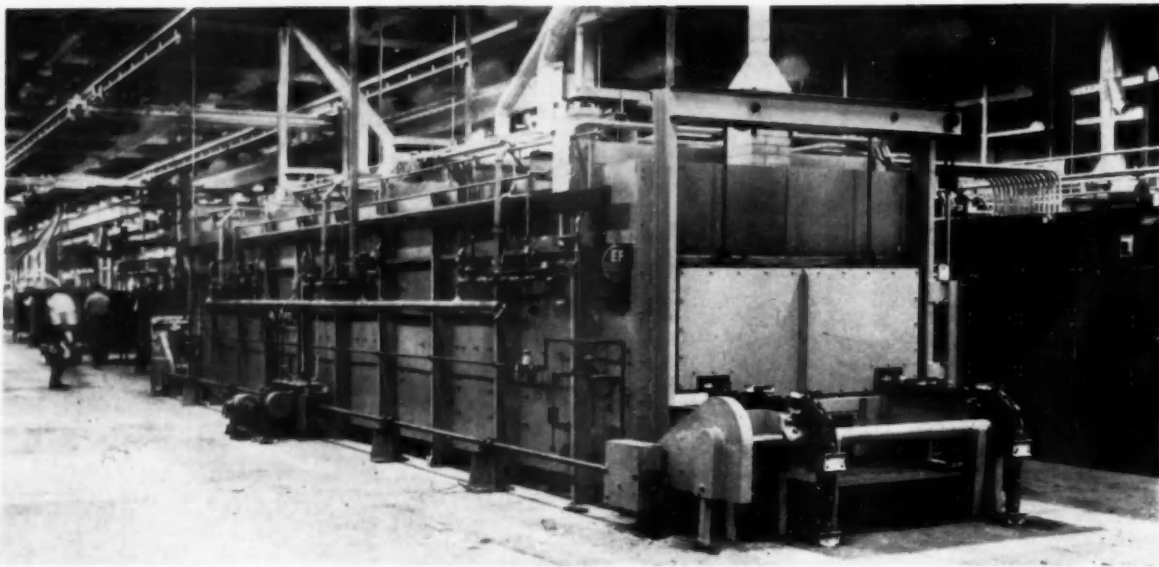
The final area is in the proper placement of processing facilities, such as washing, drying, and painting. In this instance consideration is given to mounting drying facilities, as one example, up in the ceiling area.

Another slant on space saving was provided by R. E. Davis, Ford Motor Co., in describing the concept of overhead storage type conveyors and vertical storage of in-process material.

According to R. B. Dow, Chevrolet Spring & Bumper Div., the stamping or press plant represents one of the more costly types of floor space found in the industry due to the high bays, extensive pits or basements, scrap handling, etc. In their operation the use of progressive dies is one good way to effectively use such costly floor space. He detailed the features of three principal types of progressive die arrangements as follows:

1. Stock itself carries parts through the die.
2. Transfer mechanism is part of the die.
3. Transfer mechanism is part of the press.

Obviously the use of progressive dies in combination with transfer type presses results not only in a
(Turn to page 84, please)



This direct fuel-fired chain strand conveyor furnace is one of three utilized for preheating prior to welding gas turbine shaft rim assemblies. The specified capacity of the particular unit shown is 9600 lb per hour of steel heated to 600 F; maximum operating temperature is 1000 F. The equipment is also utilized for stress relieving the assemblies (Electric Furnace Co.).

Latest Developments in Heat Treating for Automotive and Aircraft Fields

PART II

Heat Processing Furnaces in Aircraft Industry Reviewed And Contrasted With Automotive Units Featured in Part I

THE aircraft industry accounts on the average for at least five per cent of the total annual sales of heat processing furnaces. The percentage of course, represents only the normal share of sales going to the aircraft industry. In any given year, the ratio could be quite different depending upon the expenditure plans of the industry in relation to those of other industries. The volume of Government contract awards for planes and missiles also influences to a marked extent outlays for capital equipment by aircraft manufacturers.

It was pointed out in Part I (see AI, April 1) of this article that a tremendous variation exists among the types, sizes, and values of heating equipment installations. As a result, it is difficult to esti-

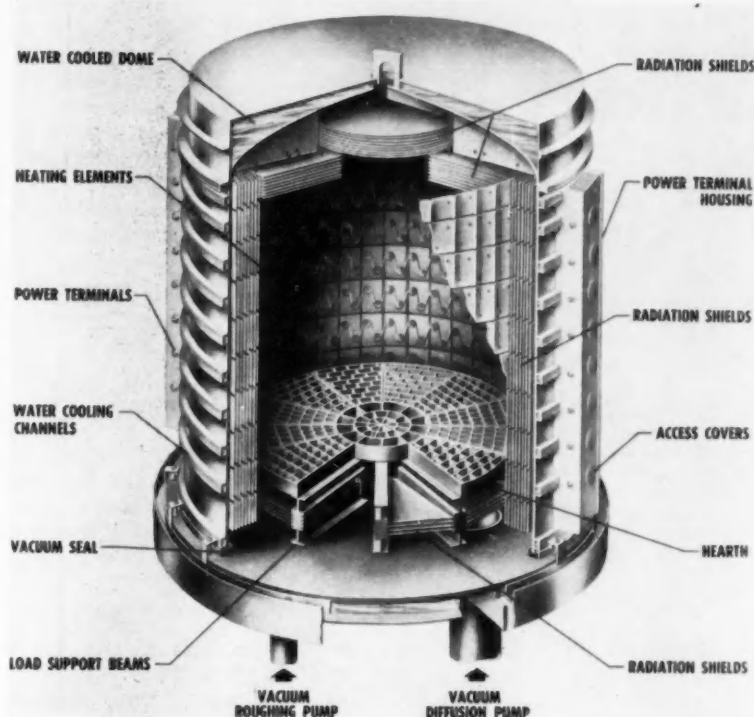
**By
Andrew W. Shearer**

mate with any degree of accuracy the costs for equipments in any industry. However, for the sake of discussion, a fair estimate of the average value of a furnace installed in a typical aircraft plant

would be approximately \$25,000.

Table I shows the total numbers of furnaces installed in the plants of a representative cross-section of aircraft manufacturers as of September, 1958 (approx.). Their ages in the ranges of 0 to 5, 5 to 10, and 10 and over years are also documented. If the grand total of 805 furnaces owned by the 13 manufacturers listed is multiplied by the factor of \$25,000 (estimated average cost), it is indicated that this group alone has some \$20.125 million invested in its furnace equipment.

Broadly speaking, practically all



Here is a cutaway view of an electric radiation shield furnace with two-stage vacuum system. No protective atmosphere is used, and temperature range is 1500 to 2350 F. This and other vacuum furnaces are used to bright anneal and braze high temperature alloys, as well as to anneal, braze, and degas titanium (Industrial Heating Dept., General Electric Co.).

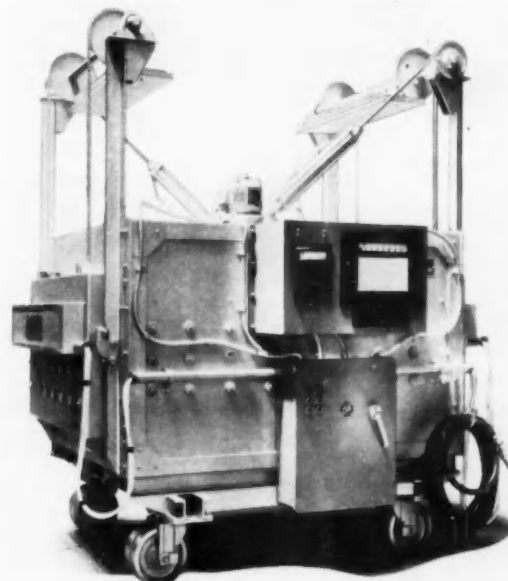
of the types of furnaces listed in Part I for the automotive industry could be repeated here for the aircraft industry. For the most part, the processes and equipment used are quite similar, particularly as concerns engine manufacture.

However, there are a number of unique installations in the aircraft industry. The development of new heat-resistant alloys for high-speed aircraft and the heating operations involved in developing these metals could be the subject of many volumes. Vacuum melting and heat treating, the extensive use of furnace atmospheres, and such specialized operations as brazing (particularly of honeycomb sections) are all topics meriting detailed study.

Space limitations here, though, permit only a brief discussion of the most important types of furnaces used in aircraft manufacturing operations and typical parts heat treated in these units. Among the various types of equipment listed, the nitriding, the bottom-

opening types (including vertical traveling or gantry), and the vacuum furnaces are almost exclusive to the aircraft industry.

This double-end box is used at the Martin Co. for hot forming of titanium. It is mounted on casters so that it can be used to heat parts for drop hammers and hydro-presses in several locations (Hevi-Duty Electric Co.).



AIRCRAFT ENGINE INDUSTRY

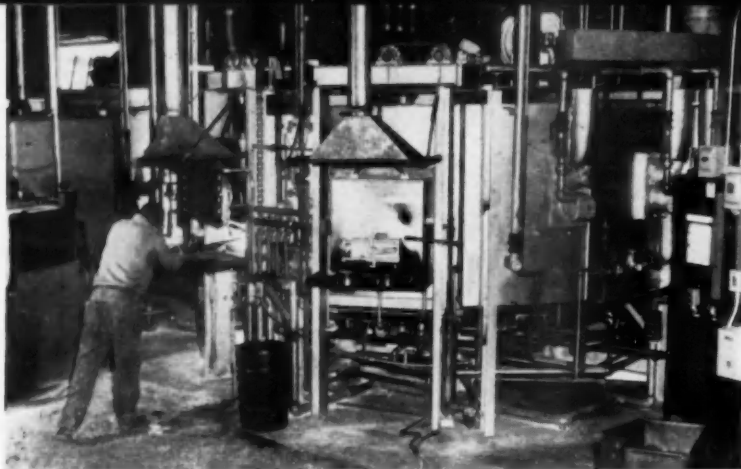
Box

Box furnaces with an integral quench (radiant tube, gas-heated) are used for carburizing, carbonitriding, and hardening (without decarburization) steel. Splined shafts, gears, and many other engine parts are heat treated with forced convection at temperatures of 1350 to 1700 F in an endothermic atmosphere (sometimes plus ammonia). A quench tank is built in front or rear to permit the quenching of hot steel without exposure to air. Manual operation is generally used.

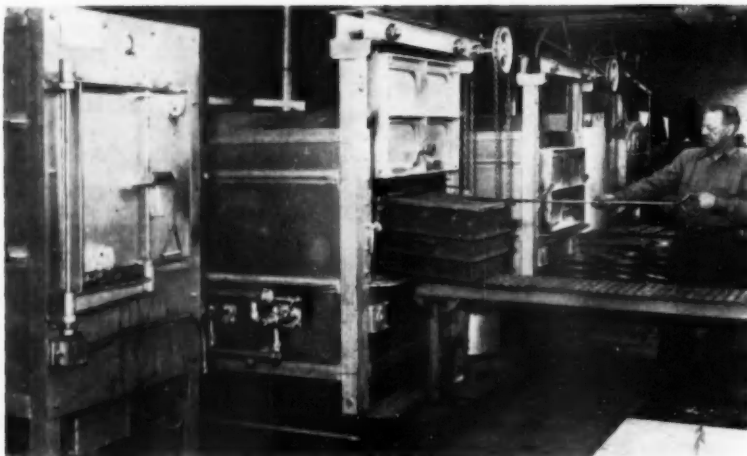
A companion type of equipment is the box-type draw or tempering furnace. Electric or gas-fired with forced convection heating, it is used for drawing or tempering steel parts previously hardened in the above high-temperature box furnace. Temperature ranges from 500 to 1200 F, with an air or non-combustible exothermic protective atmosphere, are employed.

Roller Hearth

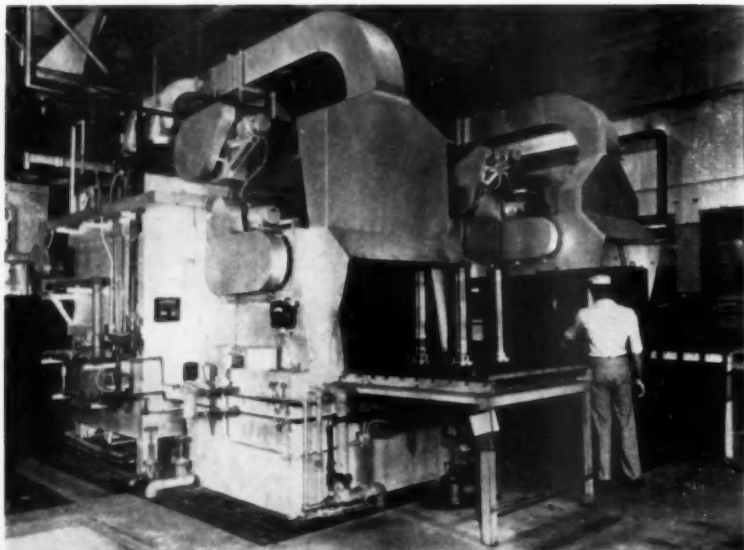
These furnaces are electrically heated for brazing up to 2100 F, but they can be radiant tube gas-heated for temperatures of 1700 F and below. They operate with an



This doughnut-shaped rotary hearth type furnace with separate charge and unload doors is in operation at the Newington, Conn., plant of Fafnir Bearing Co. It processes high-speed steel ball bearing rings used primarily by the aircraft industry in unusual high temperature applications. The furnace has an overall diameter of 13 ft, and can produce over 400 lb per hour of treated work. It performs both preheat and high heat operations (Holcroft & Co.).



These two large oven furnaces and horizontal convection furnace are part of the heat treat department in a Cleveland, O., plant manufacturing aircraft components. The installation also includes two vertical convection, a vertical muffle, a horizontal muffle, and a cooling pit (Surface Combustion Corp.).



exothermic or CO₂ free exothermic protective atmosphere depending upon steel used and need to prevent decarburization. Roller hearths are used primarily for the copper brazing of steel assemblies, heat treatment of large quantities of small parts such as jet engine blades, and for forging normalization.

Mesh Belt

Electrically heated mesh belt furnaces of the "Hump" type are used for annealing or brazing of stainless steel parts without surface oxidation. Purified dry hydrogen is used as a protective atmosphere, and operating temperatures range from 1500 to 2100 F.

Vertical Cylindrical

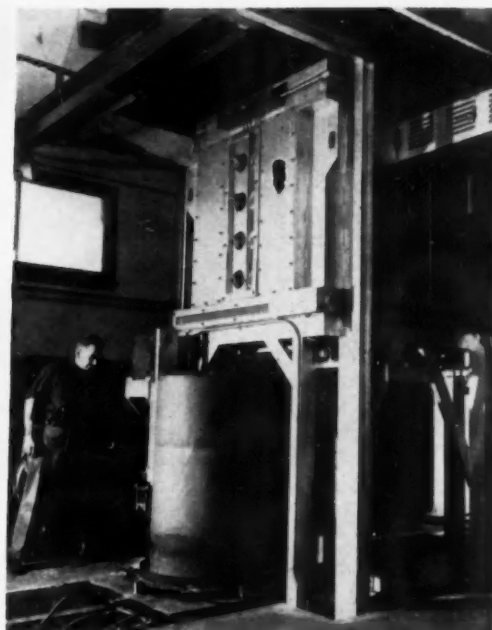
This type of furnace is used for gas carburizing many engine parts to impart greater wear resistance. The material is supported on trays, which are usually stacked in the furnace. Forced convection is used to accelerate heating and to obtain uniformity of temperature and gas distribution. Operating temperatures run from 1600 to 1750 F, and a special vaporized oil, natural gas, or propane serves as a carburizing atmosphere.

Bell

Electrically heated bell-type furnaces are used to bright anneal steel and stainless steel parts and to braze various parts. A metallic retort is used to enclose charge of material and keep it surrounded with suitable protective atmosphere (dry hydrogen or helium) during heating and cooling.

Certain furnaces of this type with operating temperatures of 900 to 1100 F are used to put a hard wear-resistant nitrided sur-

These two furnaces are installed in the Chicago, Ill., plant of the Ford Aircraft Engine Div. for controlled atmosphere heat treating of jet engine parts. Each unit has a product heating space of 44 in. wide by 44 in. deep by 30 in. high. The quench is equipped with a circulator and two-level elevator to prevent the possibility of charging the furnace while the previous load is still in the quench (Industrial Furnace Div., Sunbeam Corp.).



Stainless steel missile and jet engine parts are copper brazed without decarburization in this elevator furnace at Fabriform Metal Products, Inc. The furnace is capable of holding a ton of parts stacked 30 in. high within a 24 in. diam; temperatures up to 2100 F can be obtained in the Inconel retort (Harper Electric Furnace Corp.).

face on parts such as cylinder liners. Anhydrous ammonia serves as an atmosphere and is partially dissociated during the process. Na-cent nitrogen causes the reaction with iron to provide the hard iron nitride case.

Reciprocating

Double-end, electrically heated, reciprocating, bell-type furnaces are used for nitriding gears, pinions, cylinder liners, etc., and have a double hearth, each end of which is equipped with a retort. Work is first placed on one hearth, and a retort placed in position, after which the air is purged from the retort.

Ammonia is supplied to the inside of the retort. While the first charge on one end of the hearth is heating, a second charge is placed on the other end of the hearth and purged of air. After the first charge is heated, the heating chamber is removed and placed over the second charge. The first charge is allowed to cool and is then unloaded and replaced with a new charge.

Rotary Hearth

An exothermic of CO₂ free exothermic atmosphere with a tem-

perature range of 1500 to 2300 F is used to heat gears and similar parts for hardening in electric or fuel fired rotary hearth furnaces. This type of furnace is also employed for heating parts such as jet engine compressor blades for forging.

Vacuum

Two basic types of vacuum furnaces are commonly used in aircraft manufacturing. One is a conventional bell-type furnace similar to that mentioned above. However, arrangements are made to evacuate

TABLE I

TYPICAL AIRCRAFT FURNACE INSTALLATIONS

Manufacturer	Total	0-5 Yrs.	5-10 Yrs.	10 Yrs. & Over
Beech Aircraft Corp.	57	11	16	30
Boeing Airplane Co.	128 (b)	63	19	44 (c)
Cessna Aircraft Co.	19	—	—	—
Company X (d)	44	—	—	—
Convair Astronautics	13	7	6	—
Douglas Aircraft Co., Inc. (a)	104 (b)	19	41	44
Hiller Aircraft Corp.	2	—	—	2
Kaman Aircraft Corp.	8	—	—	—
North American Aviation, Inc., Los Angeles Div.	243	24	195	24
Piper Aircraft Corp.	3	—	2	1
Rohr Aircraft Corp.	101	55	28	18
Sikorsky Aircraft Div., United Aircraft Corp.	44	—	—	—
Vertol Aircraft Corp.	53	22	31	—
TOTALS	805	221 (e)	338 (e)	173 (e)

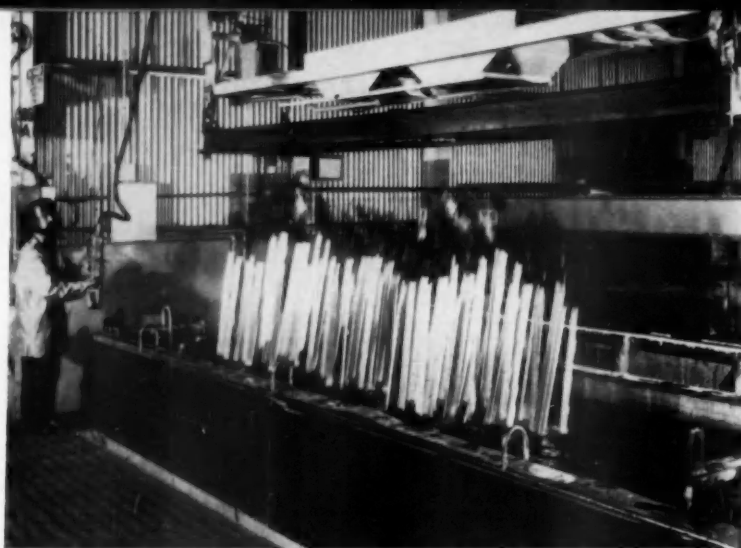
(a) Two Calif. divisions only.

(b) Induction heating units included (no separate data furnished).

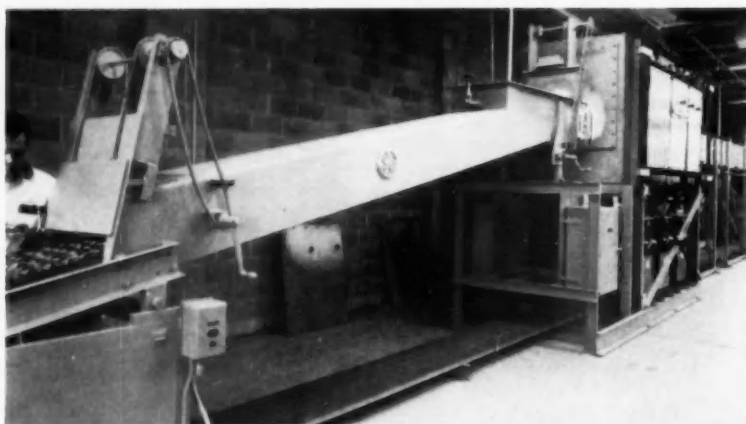
(c) Includes 19 units of indeterminate age.

(d) Permission not given for identification.

(e) Partial totals only.

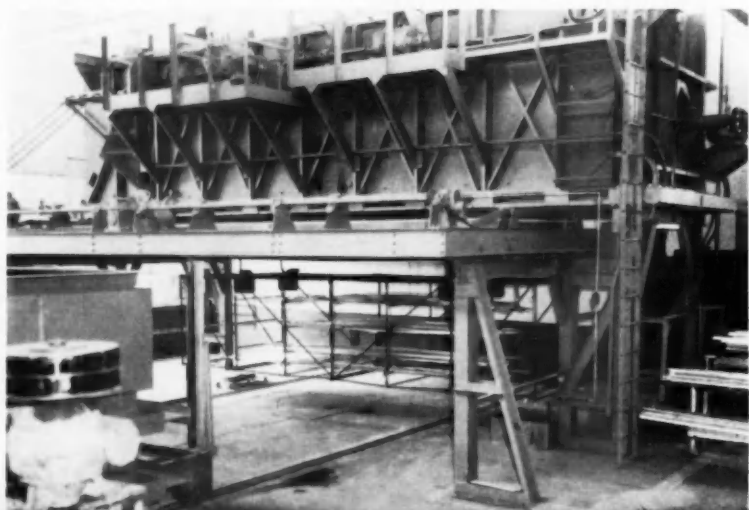


Aluminum alloy aircraft parts are shown in "free fall" during cold water quenching operation at North American Aviation, Inc. Prior to quenching, parts are solution heat treated in 200-kw electric salt bath in background (Ajax Electric Co.).



An electrically heated hump-type mesh belt furnace, designed for annealing or brazing of stainless steel parts without surface oxidation, is shown in operation at Specialty Steel Treating, Inc. It uses purified dry hydrogen as a protective atmosphere, and operating temperature range is 1500 to 2100 F (Industrial Heating Dept., General Electric Co.).

Specified capacity of this electrically heated bottom-opening furnace is 3500 lb per hour of aluminum alloy heated to 950 F. It utilizes forced circulation for improved heat transfer and uniformity characteristics and incorporates a quench built under the furnace heating chamber (Electric Furnace Co.).



retort inside and to partially evacuate inside of furnace to reduce atmospheric pressure on outside of hot alloy retort.

A second type of furnace is one commonly referred to as a "cold wall" or "radiation screen" vacuum furnace. This furnace contains no refractory heat insulation, as metal shields retard heat loss; entire furnace is evacuated.

Used to bright anneal and braze high temperature alloys and to anneal, braze, and degas titanium, these furnaces usually have no protective atmospheres; temperature range is 1500 to 2350 F. However, to accelerate cooling, these furnaces may on occasion be equipped to circulate an inert protective atmosphere.

AIRFRAME INDUSTRY

Box

Box furnaces with integral quench and companion box-type draw or tempering furnaces, described in the Aircraft Engine section, are also used in the airframe industry. Large box-type furnaces are used in the latter field for general heat treating and most recently for stainless steel honeycomb brazing. Atmosphere is usually CO₂ free exothermic with a temperature range of 1600 to 2150 F.

Still another box-type, that with metal-lined ovens, is used in the airframe industry for reheating quenched aluminum alloys, after forming, to age-harden the alloys. Electric or gas-heated, this furnace uses forced convection to insure uniform temperatures of 300 to 400 F.

Elevator

Usually electrically heated, forced convection is advised with this type of furnace to accelerate attainment of uniform temperature of aluminum alloy parts. No protective atmosphere is used for solution heat treating of aluminum alloy parts to about 950 F and water quench; temperature range is 850 to 1100 F.

Pit

Electric or radiant tube gas-heated, these furnaces are used to heat long parts such as landing

struts. Temperature range is 1400 to 1800 F, and protective atmosphere is CO₂ free exothermic.

Pit type furnaces of the low temperature type (300 to 1200 F) use forced convection to obtain uniform temperature and to accelerate heating. As a general rule, no protective atmosphere is used for such applications as drawing hardened parts.

Bottom Opening

Electrically heated, this equipment utilizes forced circulation for improved heat transfer and uniformity characteristics. It incorporates a quench built under the furnace heating chamber for rapid quenching of aluminum alloys followed by heating (solution heat treating). Some of this equipment is used for aging at low temperature with no quench.

Vertical Traveling (Gantry)

This is an adaptation of the bottom-opening type described above except the work is supported in a vertical rather than a horizontal position. The furnace is mounted on wheels which run in tracks in the foundation. The furnace is located over a pit for loading, and, after the work is pulled up into the furnace chamber, the entire furnace is moved over a quench tank for quenching the heated work.

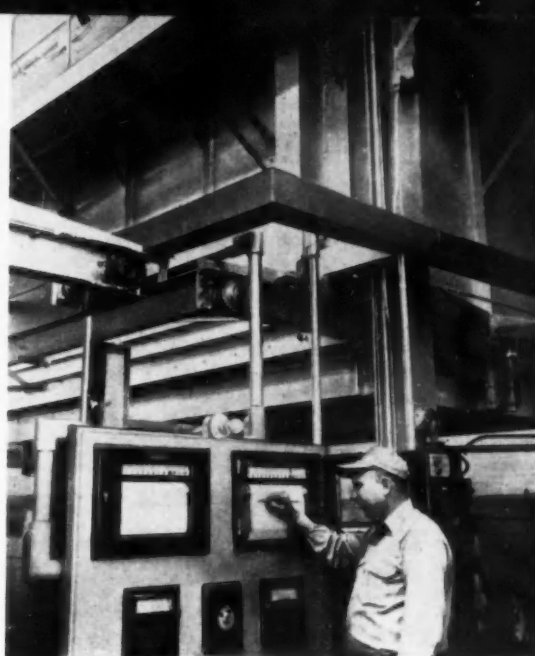
Usually electrically heated, these furnaces are used for heating large, long parts for hardening by quenching. Landing struts or solid fuel rocket engine cases are typical examples. Temperature ranges from 1500 to 2100 F, and atmosphere is the CO₂ free exothermic type or endothermic.

Salt Baths

Low temperature (800 to 1000 F) molten salt baths are used to heat aluminum alloys for annealing and solution heat treating. Bath is usually a molten mixture of sodium and potassium nitrate.

High-temperature (1500 to 2300 F) salt baths are usually electrically heated, especially in temperature range above 1650 F. Applications include heating steel parts

Technician marks on recorder chart time that batch of B-47 parts enters solution heat treatment furnace at the Georgia Div. of Lockheed Aircraft Corp. Both zones of furnace are controlled by Electronik strip chart potentiometers with proportional electric control. Also included on instrument panel to each furnace are Protect-O-Vane electric power controls (Industrial Div., Minneapolis-Honeywell Regulator Co.).



prior to quenching for hardening and for case hardening wearing surfaces on steel parts. Salt imparts a carbide-nitride case to steel.

Bell Furnaces

(Same as in Aircraft Engine Section.)

Vacuum Furnaces

(Same as in Aircraft Engine Section.)

CONCLUSIONS

Aircraft production methods as a whole are geared to extremely rigid specifications. In spite of the numbers of planes produced in this country, the aircraft industry cannot properly be called a mass production one.

Except in times of war or emergency, aircraft designs are seldom frozen for long. By contrast, the design of a passenger car, for example, is firmly established for a year or longer with minor changes. This factor alone prevents drawing any real parallel between manufacturing operations in the aircraft industry and those in the automotive field.

As far as heat treating is concerned, the trend in the automotive industry seems to be toward continuous, automated furnaces for production of the increasing number of parts being designed for lower costs. In the aircraft industry, on the other hand, the trend is toward higher quality, higher

temperature work; price is often a secondary consideration.

Many of the brazing, annealing, and bright hardening operations on stainless steel aircraft and missile parts are being carried on today in large batch type furnaces, in which temperatures, atmospheres, and, in many cases, vacuum can be carefully controlled. It should be mentioned in passing that vacuum heating technology is one field which is advancing rapidly.

High-temperature service requirements of missiles, rockets, and jet aircraft and the need for elements to withstand radiation effects have all been responsible for the development of new materials and the expanded use of those which were only laboratory curiosities a comparatively short time ago. Each of these developments has required new and involved heat treatments. Temperature barriers are being broken every day with furnaces which will handle these new materials as Man expands his conquest of space.

Acknowledgments

The author is indebted for background information and photographs of heat processing furnaces in the aircraft industry to the companies which supplied similar material for Part I on automobile units. Appreciation is also extended aircraft manufacturers who supplied data on their installations. ■

How to Fixture Honeycomb Sandwich for Brazing

Frank J. Filippi

Project Liaison Engineer

SOLAR AIRCRAFT CO.

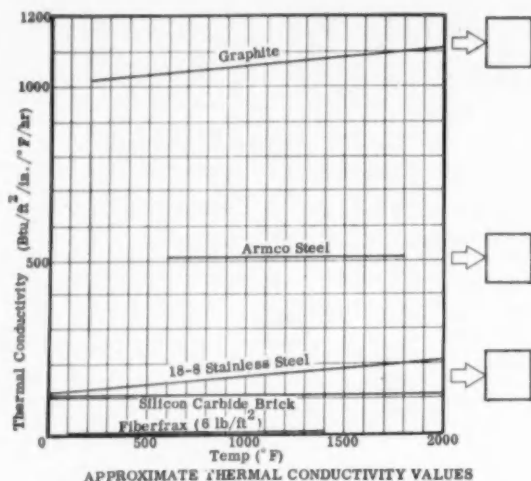


Fig. 1—Thermal conductivity of a few common materials

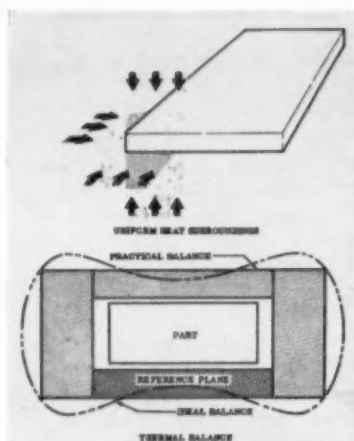


Fig. 2—How heating occurs in a flat plate immersed in uniform radiant heat surroundings.

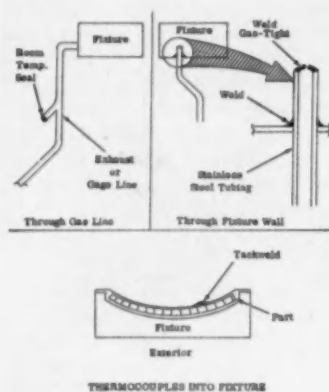


Fig. 3—Three possible arrangements for measuring temperature at the extremes of the gradient.

THE primary function of a firing fixture for brazing honeycomb sandwich is to hold all brazing surfaces in contact during the furnace cycle. Equally important is the need for controlled environment, so that the brazing alloy may flow around and through the joints. Gas flow in most systems is continuous through the sandwich assembly to control environment.

Initially, the thermal conductivity of the fixture material has a significant effect on the rate and manner in which the sandwich heats. Figure 1 is a comparison

of a few common materials. The influence of thermal conductivity is demonstrated by analyzing how heating occurs in a flat plate immersed in uniform radiant heat surroundings, Fig. 2. At the corners, heat is absorbed by radiation from four surfaces while the center is only exposed on two surfaces to radiation. The temperature gradient between the corners and the center then is controlled by how fast heat is conducted from the corners to the center. Normally, conductivity alone cannot reduce the gradient to safe limits. One manner in which gradient is reduced is to surround the part with an ideal thickness of suitable material. More practically, the effect of the reference plane is offset by an equivalent mass on the opposite side, and more mass at the ends.

Problems are also generated by the necessity for measuring temperatures at the extremes of the gradient. Introduction of thermocouples through the wall of a gas-tight fixture at 1650 F to 2200 F is not a simple task. Figure 3 shows three possible solutions, one of which merely avoids entering the fixture.

Fixtures which apply pressure pneumatically to the sandwich basically are subdivided into "vacuum" or partial pressure, and positive pressure types. In a vacuum device, a negative pressure is maintained inside which causes

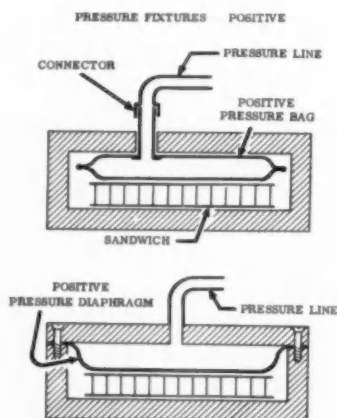


Fig. 4—Either a bag or a diaphragm may be used to apply positive pressure.



the thin seal to exert a force tending to hold the sandwich against the reference plane.

Positive pressure fixtures may utilize either a bag or a diaphragm to apply pressure, Fig. 4. This method is sometimes preferred since leakage does not present serious problems if pressurization is accomplished with high quality protective gas. If hydrogen is used, a pressure system also eliminates the explosion potential inherent in a vacuum fixture.

Typical pneumatic fixturing produced a part which consists of six segments of honeycomb sandwich and six box channels brazed separately as sub-assemblies. The sandwich pieces were made with vacuum fixturing, and the box channels were held together mechanically during brazing. The sub-assemblies were then positioned in an outer fixture, and an inner pressure diaphragm was inserted to maintain necessary pressure. Inner and outer fixtures are shown in Fig. 5. Mechanical fixtures are invariably heavier and more complex and there are few applications where they have merit.

A retort provides a protective atmosphere around a honeycomb sandwich fixture to protect the fixture and its contents from oxidation, particularly when leaks develop in a vacuum system.

Lightweight retorts are most desirable from an over-all economy standpoint. Less material is used, fabrication is simplified, heating rates are faster, repair and maintenance are facilitated, and smaller handling equipment is needed. This attractive picture is

dimmed somewhat by a tendency for great distortion and shorter life in exchange for lightness. The designer can overcome distortion and life problems by careful design to minimize the thermal stresses induced by rapid heating.

Retort materials may be substantially downgraded and still exhibit longer life by proper choice of ceramic or metallic coatings. Aluminized coating appears most attractive since, in addition to providing oxidation resistance, the surface conductivity distributes the heat sufficiently to further minimize distortion.

Introduction of gas into the retort may range from an open line to carefully drilled manifolds as indicated by Fig. 6. All figures showing retorts are for containment of lighter-than-air gases. Heavier-than-air gases are more satisfactorily introduced at the bottom and removed from the top, directly opposite from lighter gases.

Two things are necessary for optimum retort operation: (1) the gas must have controlled direction; (2) distribution must be uniform. Direction is determined by location of inlet and exhaust orifices. Distribution is controlled by providing a multiplicity of orifices, and diffusion of the gas stream by impingement against the top further aids distribution.

One approach of controlling exhaust gas is through a sand seal as sketched in Fig. 7. This method of sealing is simple, fast and economical. The difficulties which arise from distortion caused by the insulating properties of the

(Turn to page 106, please)

A. SINGLE ORIFICE

B. MULTIPLE ORIFICE—LINEAR

C. MULTIPLE ORIFICE—CIRCULAR

Fig. 7—Seals for controlling exhaust gas.

THERMOCOUPLES INTO RETORT

TO FURNACE

Fig. 8 — Sand-filled trough to seal around thermocouple tubes.

Diagram illustrating the components of a vertical shaft furnace system, including:

- RETORT (VERTICAL MOVEMENT)
- RETORT (H.P.)
- WATER JACKET (FEED)
- INNER HYDRAULIC BAR
- OUTER HYDRAULIC BAR
- RETORT SEAL LOCK
- FURNACE SHEL
- AIR COOLING SELL

Fig. 9 — Integrated furnace and cooling system.

AUTOMOTIVE INDUSTRIES, April 15, 1959

Newest Communist Developments Revealed at Leipzig Fair

By David Scott

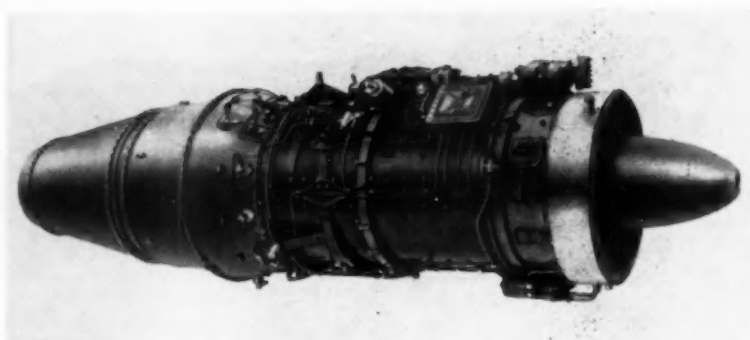
Special European Correspondent
for AUTOMOTIVE INDUSTRIES

THE Leipzig Fair in March reflected some of the first steps towards joint economic planning and industrial integration within the Communist bloc, and the division of labor on an international scale that it hopes to achieve.

In the field this means that some of the East European countries are whittling down their production programs in an attempt to boost output of selected models, while others such as Hungary are concentrating entirely on trucks and buses and have no immediate plans for making cars. Gaps in the different domestic ranges will be filled by imports from countries with complementary schedules.

At the same time, however, production of vehicles has a relatively low priority in the present scheme of things. Except for truck manufacture in Russia, which is already at a fairly high level and is to be pushed further in the coming years, the automotive industries in the Soviet orbit are Cinderellas of the ambitious expansion plans in all these countries. Their outputs are still well below the real demand in each case, and only modest increases in relation to the need are in view.

Thus the East German industry, which was strongly represented at Leipzig, is to concentrate its available capacity on a reduced number of models. Chosen favorites among its cars are the 18-hp Trabant and 37-hp Wartburg, and the 1965 combined production target for these two is about 100,000 units.



Pirna O14 jet engine for the East German BB-152 medium-range transport has a thrust rating of 6950 lb, but is planned for development to 7700 lb. Of single-shaft design, it has a 12-stage compressor and two-stage turbine.

The Trabant is made at Zwickau, which also produces the P-70 but this 22-hp plastic bodied car will be dropped entirely next year, releasing extra capacity. As a result, output of the Trabant will rise from its present annual level of 20,000 to 35,000 in 1960, and to 65,000 by 1965.

At the same time, the Zwickau-made Sachsenring S-240 (formerly Horch) will also be discontinued. This 80-hp medium sedan is being turned out only on a small scale, and was intended primarily for VIPs—not for the motoring public or export. Its place will be taken by greater imports of foreign cars in the same class, and the British Rover is believed to be a likely candidate.

Current output of the Wartburg at Eisenach is about 30,000, and future expansion will not be great since the factory is already operating at close to capacity and no sizeable new investments there are planned. Despite its small numbers this car is being exported to non-Communist markets in competition with comparable western models,

and in order to promote sales it is being produced in no fewer than nine body styles, including a station wagon, coupe, convertible and sports roadster.

But East Germany's export hopes are pinned largely on the Trabant, which is regarded as a rival of the NSU Prinz, Dutch DAF and other "babies." From a design standpoint it has several interesting features. Although the body-chassis is of unitary construction, only the floor, interior fender panels, door frames and roof supports are steel. All exterior panels are made of resin-bonded fiber-glass, thereby reducing weight and providing noise insulation as well as lowering tooling costs.

The two-stroke engine is a two-cylinder aircooled unit of 30.5 cu in., developing 18 hp at 3750 rpm, that is combined with the gearbox, differential and suspension assembly as a compact front-wheel-drive package. Weight of the bare engine is kept down to 210 lb by using aluminum finned cylinder barrels that are cast integral with the iron liners.

Another design feature is the system for interior ventilation and heating. An adequate supply of warm air is supplied from a heat exchanger surrounding a section of the exhaust pipe, with a forced draught derived from the output of the cooling fan. In summer the flexible outlet pipe leading to the car interior is detached from the exchanger and shifted to a fresh air duct on the front fender panel.

While East Germany's truck production is even smaller than that of cars, it is to be rationalized by limiting the range to a maximum payload rating of 5 tons. In fact, the present program covers only three basic models for the entire country.

Smallest is the Barkas V901-2, made in Karl-Marx-Stadt (formerly Chemnitz), a $\frac{3}{4}$ -ton chassis with a 28-hp two-stroke engine produced as a pick-up, delivery van and microbus or ambulance. The 2-ton Robur, powered by a four-cylinder aircooled engine with an option of a 60-hp gas unit or 52-hp Diesel, is produced in Zittau. Latest version of this offers four-wheel drive.

On the aircraft side East Germany once again displayed components of its BB-152 jet transport whose existence was revealed at Leipzig a year ago. It now views this four-engined medium-range craft as a serious export proposition, and series production has al-



The East German Trabant has a steel unitized chassis with plastic exterior panels. The 18-hp two-stroke engine is integral with the gearbox and front-drive assembly.

ready started. Planned output for 1960 is six planes, it was learned, with 18 the target for the following year.

Among other Communist exhibits, China made a surprise display of one of its first home-built buses. Believed to be of local rather than Russian design, it was powered by a rear-mounted six-cylinder Diesel of 180 hp, has a 17-ft wheelbase and weighs 8.6 tons. The Chinese also showed several Diesel engines, including a large 930-hp marine type and an 80-hp automotive or industrial unit. In addition, some of China's first-ever tractors were revealed.

Czechoslovakia presented the Skoda Octavia, evolved from and replacing the 440 and 445 models. While retaining the tubular back-

bone chassis frame with a rigid differential and swing axles at the rear, it now has conventional coil springs in front instead of the former transverse leaf. In addition, the 66-cu in., 43-hp engine (47-hp in the Super model) has been altered to have an aluminum cylinder head as well as block. Annual production of the Skoda at the Mlada Boleslav factory was stated to be 45,000.

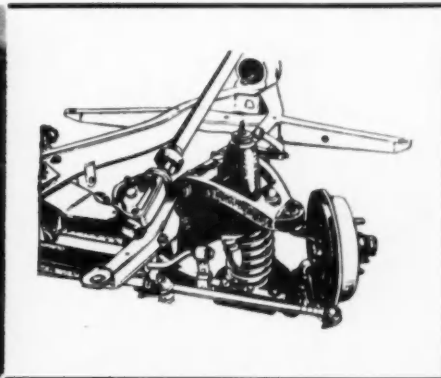
Yugoslavia displayed a new luxury coach based on an Austrian Saurer-engined chassis, built under license, powered by a 130-hp Diesel.

Western vehicle exhibitors at Leipzig this year included Rootes, Rover, Renault, Simca, Berliet, Daimler-Benz, M.A.N., Deutz and Kaelble. ■

Two-door Octavia, latest version of the Czechoslovak Skoda, now has coil suspension units mounted on the engine cradle extending forward from the tubular backbone chassis.



Front suspension of the Skoda passenger car



British Ford Uses Limited-Volume Tooling To Make 150 Tractors Daily

By David Scott

B RITISH Ford has now completed its \$12.6 million tooling program for the 32-hp Diesel-engined Dexta tractor that was introduced in November 1957. Nearly 700 new machines have been installed at the Dagenham plant, including American transfer lines, multi-way drilling and tapping machines from Canada, French and Swiss copy lathes, German fine borers, and equipment of all types from Britain.

Current output is about 150 tractors a day, and the tooling incorporates the most modern machines available in relation to this volume. Aside from the transfer lines there are a number of two- and three-station units, but an uneconomic degree of automation is avoided. Thus single machines are mainly linked by roller track, although many of them include automatic devices for loading, clamping and unloading. In addition, laborious handling of heavy components by hoist is confined to the start and finish of the various lines.

Major castings for the clutch, transmission and differential housings are machined on three lines with a total length of 300 ft. These include eight transfer machines,

all of which are American, or of U. S. design built in Britain. One of the highlights of the clutch housing line is a C.V.A. Kearney & Trecker three-station miller that faces the large mounting flange.

On account of the size and structure of the casting there is an unusual loading and clamping arrangement at each station to support the bell flange. Work is moved sideways along the transfer rails, and at the pre-load position a pivoted carrier swings it rearwards with an up-over-down motion so that the flange overhangs the back of the track.

At the same time it is located on dowels while the bottom of the bell is dropped onto the lower support. The casting is then clamped in the wrap-around fixture by five radially-disposed steadies bearing against the rim of the open end. These are actuated by hydraulic rams that are lightly loaded to prevent distortion of the sizeable hollow workpiece.

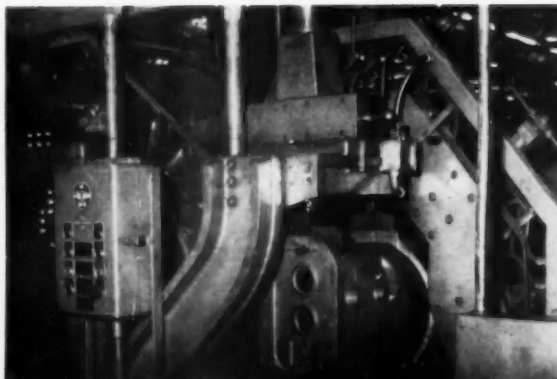
At the first station the flange is rough milled by a pair of overlapping cutters on the traversing head. It is finished at the second station by one small planetary cutter that circulates over the face.

These machining methods avoid the use of a single large cutter, thereby lengthening tool life and shortening the required stroke. The square end flange is rough and finish milled at the third work station, where two 10-in. overlapping cutters are followed by a 20-in. tool on the same slide.

Another feature of this line is an Alfing vertical fine borer with two in-line work stations. Housings approaching clutch-face-down on the roller track are drawn by pawls on the transfer bar into the first station for location and clamping. Operations on the rear face cover machining the two large bearing bores and reaming the dowel holes, after which the bores are grooved to take retaining rings. Prior to this, the boring, drilling, counter-sinking and tapping of both ends is carried out on two W. F. & John Barnes transfer lines of 6 and 19 stations.

One of the points of interest on the differential housing line is the loading mechanism on the C.V.A. Kearney & Trecker three-sided unit that roughs both axle bores and flanges, and mills the front face. The shuttle-loader lies across the roller track, and picks up each incoming casting on its bottom face with an elevating cradle that raises it off the track. U-shaped claws descend to engage the top of the front flange, drawing the casting across to position it in the fixture. The cradle then lowers it onto the location pads, and the work is hydraulically clamped downwards by four pins. The opposed double-tooled spindles feed into the large

Front view of the first station of the CVA Kearney & Trecker miller that roughs and finishes the large mounting flange of the clutch housings. Work is carried rearwards into wrap-around fixture by motion of a pivoting carrier.



Mills horizontal press adapted for inserting bearing cones in the machined bores on the bell ends of axle housings. The casting is lifted off the roller track by an elevating fixture so that its bore is located in line with the ram.



axle bores while the front face is milled by a travelling head. Among subsequent operations are further drilling, countersinking and tapping on a Barnes 20-station transfer line and 16- and 8-station Footeburt lines.

The axle housing line comprises mainly single machines tooled for high-output production. One of these is a Mills six-ton horizontal press adapted for inserting the bearing cone in the machined bore on the bell end of the casting. Work is manually positioned at track level in the hydraulic lifting fixture and a cup is hand-loaded in the elevated ram. The fixture then raises the housing so that its bore is positively located in line with the ram axis, when the cone is pressed home.

Single machines also make up the axle shaft line, and a number of these are of advanced design. For example, thrust faces are ground on a specially-built Snow horizontal surface grinder designed for continuous operation. The drum-type fixture carries six shafts which are successively loaded by hand in matching holes and slots around the circumference of the two rotating disks. Spline ends project through the holes to expose the faces for grinding, while the flange ends seat in the slots where they are automatically secured by hydraulic clamps as the fixture turns beyond the loading position. Shafts locate on the flange shoulder, enabling length to be maintained to within 0.002 in. as the work passes across the 20-in wheel.

Ford makes all the hydraulic lift

equipment for the Dexta tractor, and an unusual feature of this section is the three setups for gun drilling the valve bores and intersecting holes in the cast iron cylinder body. Machines are British-built Ex-Cell-O fine bores cutting at 300 fpm with a feed of 0.002-0-003 ipr. This high-speed method of precision boring is claimed to produce a finish far superior to any previously achieved by other processes.

The high-pressure coolant is used at 300-600 psi, with the cutting oil purified by an elaborate system of filters. Oil for the first machine, finishing the valve bores, is initially cleansed by an Ex-Cell-O dredger that extracts chips and heavy particles, after which it is weired into settling tanks. The coolant then passes through a Philips magnetic

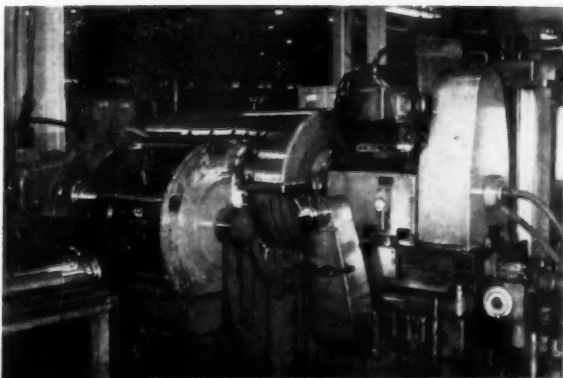
clarifier, and finally through a Purolator Micronic cartridge-type filter that is pressure-controlled to stop the machine when the element is clogged. A duplicate system is common to the other two machines.

Hydraulic units are assembled in a separate room walled off from the main factory floor and supplied with temperature controlled air, the build-up taking place on a five-position belt conveyor. Completed assemblies are checked on a test rig simulating actual tractor conditions, with an electric motor driving a gear-type pump. All normal functions are checked with the integral quadrant control lever, and the implement linkage is required to support a 1250-lb weight for two minutes without exceeding the tolerable oil loss or seepage. ■



General view of the final assembly line for both Dexta and Fordson Major tractors at the Ford plant in Dagenham, England. Current output is about 150 Dextas a day.

Snow horizontal surface grinder is adapted with a drum-type fixture, which carries six workpieces, for continuous grinding of axle shaft spline-end thrust faces. Flange ends of shafts seat in slots and are hydraulically clamped.



One of the gun drilling setups using Ex-Cell-O fine borers for high-speed precision machining of the valve bores and intersecting holes in hydraulic lift cylinder bodies. An elaborate system of filters purifies the coolant.





Electrochemist examines die cast zinc panels being studied for corrosion resistance of Battelle Memorial Institute, Columbus, O. This work is part of American Zinc Institute-sponsored program investigating corrosion protection achieved with newly-improved plating procedures already used by several automotive parts producers. The panel displaying superior resistance (left) was electroplated with copper, nickel and bright crack-free chromium. The other panel was electroplated with copper, nickel and regular chromium. (Photo courtesy American Zinc Institute, Inc.)

Decline in Trim Usage Is More Than Balanced By Rise in Number of Functional Applications

Zinc Die Castings in 1959 Cars

IN ITS all-out drive to revitalize consumer interest, the automobile industry emerged this year with a change of pace in styling and functional concepts. Simplicity of decor has been emphasized in nearly all car lines. To a large extent, decorative trim — whether stainless, chromium-plated zinc, or aluminum — has been reduced in quantity and size.

How has the current pattern of transitional changes in passenger car design and engineering affected the zinc industry? Fundamentally, not at all, according to the American Zinc Institute. While the present deemphasis in decorative trim has reduced the use of zinc (as well as other materials) for this purpose, AZI reports that the loss has been more than offset by increased zinc consumption for other automotive applications.

In 1957, 440 million lb of zinc went into automobiles and accessories, while 314 million lb were used in 1958. However, when the

6.2 million cars produced in 1957 are compared to the 4.3 million made in 1958, it is apparent that zinc more than held its own on a per-car consumption basis. This position continues in 1959; and there are indications for a notable increase in the use of zinc in 1960 car models.

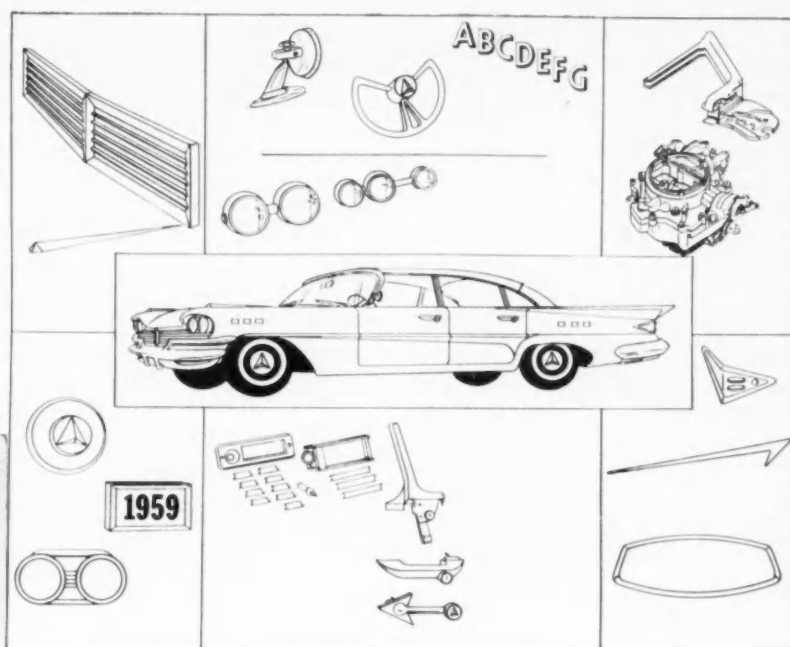
Zinc Serves Numerous Needs

Some 12 per cent of all zinc die castings being used in the 1959 passenger car models are for purely decorative applications — emblems, medallions, name plates, and trim. About 18 per cent are found in such functional applications as



This Dodge instrument cluster frame is produced as a single zinc die casting. The one-piece design minimizes threat of rattle and reduces assembly costs.

TABLE I
ZINC DIE CASTINGS
IN 1959 COMPOSITE CAR



carburetors, fuel pumps, filters, oil seals, transmission and brake units, instrument parts, etc.

The great majority (70 per cent) of all automotive zinc die castings, however, serve a combined decorative-functional purpose. Included in this category are such parts as door and window handles and cranks, rear view mirror assemblies, headlamps and tail-lamp housings, instrument cluster panels, etc.

The automobile industry is designing a number of traditionally die cast zinc components as larger units this year. Included are the instrument clusters and many grilles or principal parts of grille assemblies. Mercury, Edsel, Lincoln, and the entire Rambler line illustrate a trend to larger and heavier die cast zinc grilles. Several of the major automotive producers who do not employ die cast zinc grilles in their 1959 models plan a return to them in 1960.

Popularity of the four-door hardtop has provided another solid market for zinc die castings used as window frames. Other interesting applications for zinc die castings are turn-signal operating mechanisms and steering wheel shrouds.

The intricate modern automo-

bile carburetor uses many zinc die castings in parts other than items such as linkages (primarily steel rod), cams and butterfly valves (usually steel sheet), and adapter flanges (usually cast iron). For example, three out of 14 models of 1959 cars use zinc exclusively for die cast carburetor parts. Nine use assemblies of die cast zinc and aluminum parts approximately equal in weight. The zinc is used for bowls, cover assemblies, accelerator nozzles, and venturi tubes.

Carburetors in the remaining two of the 14 models use aluminum primarily for the die cast parts. Even here, however, zinc die castings (incorporated as inserts) are employed for accelerator nozzles and venturi tubes. These two carburetor applications are universal throughout the automobile industry.

Lincoln Biggest '59 User

Leading automotive user of zinc die castings in the 1959 lineup is the Lincoln sedan with a total of 91.92 lb. Typical functional die cast zinc parts in this model are the carburetor, weighing 11.06 lb, and horn components at 3.8 lb total. (Continued on next page)

FRONT END

Radiator Grille and Moldings
Grille Frame Sections
Fender Wrap-Around Elements
Head Lamp Doors
Fender and Hood Ornaments
Escutcheons; Car Name Letters
Parking Light Frames
Windshield Molding; Air Scoops
License Plate Frame

UNDER THE HOOD

Carburetor
Fuel Pump Bodies
Vacuum Pump
Ventilator and Defroster Diffusers
Automatic Transmission Parts
Horn Motor Casing and Vibrator
Distributor Parts
Blower Assembly Parts
Windshield Wiper Motor Body and Parts

SIDE

Window Frames and Separators
Door Handles and Lock Parts
Radio Antenna Housings and Mechanisms
Side View Mirror Frame and Brackets
Scuff Plates; Decorative Trim
Emblem for Wheel Hub Caps
Car Name Letters
Quarter Window Trim

REAR

Tail Light Frames and Assemblies
Back-Up Light Frames and Bodies
Trunk Ornaments, Handles, and Letters for Car Name
Window Trim; Upper Bumper Trim
Quarter Panel Molding
Fender Ornaments
License Plate Frame

INTERIOR

Horn Ring
Instrument Panel Parts
Door Handles; Ventilator Locks
Window Handles; Cranks
Dome Light Bezels
Seat Adjusting Knobs and Mechanisms
Defroster Parts
Rear View Mirror Assemblies
Ash Tray Covers and Parts
Instrument Panel Radio Parts
Rear Radio Speaker Grille
Ornaments and Trim
Parking Brake Handle
Ignition Switch; Heater Parts
Rear, Upper Quarter Panel
Coat Hooks; Robe Rail Brackets
Heater Parts
Outlet Grille; Glove Box Door

Car	Model	Weight (Lb)
GENERAL MOTORS CORP.		
Buick	Four-Door Hardtop	81.32
Oldsmobile	Super 88	40.25
Oldsmobile	98 Four-Door Hardtop	56.00
Chevrolet	Four-Door Hardtop	55.82
Cadillac	Four-Door Hardtop	90.27
Pontiac	Four-Door Hardtop	69.05
FORD MOTOR CO.		
Lincoln	Four-Door Hardtop	91.92
Thunderbird	Two-Door Hardtop	48.38
Mercury	Four-Door Hardtop	83.08
Edsel	Four-Door Hardtop	73.70
Ford	Four-Door Hardtop	56.96
CHRYSLER CORP.		
Imperial	Four-Door Hardtop	84.22
Chrysler	Four-Door Hardtop	54.12
De Soto	Four-Door Hardtop	61.12
Dodge	Four-Door Hardtop	63.94
Plymouth	Four-Door Hardtop	27.62
AMERICAN MOTORS CORP.		
American	Small Sedan	39.00
Rambler	Four-Door Sedan	60.00
Rambler	Station Wagon	74.00
Ambassador	Four-Door Hardtop	81.50
STUDEBAKER-PACKARD CORP.		
Lark	Two-Door Hardtop	33.75
Hawk Series	Two-Door Hardtop	45.00

TABLE II
POUNDAGES
OF ZINC
DIE
CASTINGS
In 1959
Automobile Models

Functional-decorative items die cast from zinc include: window frames (8.05 lb each); instrument panel housings (4 lb); door and window handles and crank assemblies (6.88 lb); and mounting and protective frames (21 lb). An assortment of decorative components such as the grille, hood ornaments, and exterior trim weigh in at approximately 18 lb total.

Running a close second in volume of zinc die castings used is the four-door Cadillac sedan with 90.27 lb. Zinc die castings are employed for such parts as the decorative air intake grille (7.75 lb), carburetor (6.0 lb.), plus an assortment of window and other frames, horn rings, and mirror assemblies.

Other automobile makers relying heavily on the advantages of zinc die castings include: the Chrysler four-door Imperial (84.22 lb), Mercury four-door hardtop (83.08 lb), American Motors four-door Ambassador hardtop (81.5 lb), and Buick four-door hardtop (81.32 lb).

New Plating Methods

An important factor in zinc in-

dustrial confidence for continued strength in the automotive market comes from Battelle Memorial Institute, Columbus, O. For some time, Battelle has been conducting tests (sponsored by the American Zinc Institute) on the corrosion performance of electroplated coatings applied to zinc die castings by two newly-improved plating techniques. Battelle scientists now report dramatic improvements achieved by the new methods.

Much of the automotive industry's use of zinc has for years been in the form of chromium-plated die castings. Corrosion resistance has thus been an important factor in car makers' acceptance of the metal. The new Battelle findings are said to give copper-nickel-chromium-plated zinc die castings increased advantages for automotive as well as many other applications.

One of the systems uses modified bright and crack-free chromium coat as thin as 0.000025 in. deposited over conventional layers of copper and nickel. Accelerated corrosion and outdoor weathering data indicate a two to three-fold increase in the corrosion protection value achieved by this new

plating approach, according to Battelle.

The second plating advance lies in a duplex nickel system that employs two layers of nickel electro-deposited in different baths under controlled conditions. The Battelle investigations show that the duplex nickel system, in conjunction with a conventional copper undercoat and chrome finishing layer, furnished much more corrosion protection than an equal thickness of a single bright nickel layer.

The findings at Battelle have contributed new knowledge of the plating processes. They have also confirmed the results of independent investigations by the platers, plating supply houses, and the automobile industry itself. These plating systems are already in substantial use and are growing rapidly.

Other Research Projects

In addition, a new expanded research program, sponsored jointly by American Zinc Institute and Lead Industries Association, was initiated in 1958 and is now actively under way. Research will cover many areas of direct relevance to the automotive manufacturer, such as the coloring of zinc die castings and the further reduction of plating costs by eliminating or minimizing the expensive polishing and buffing stages.

The new program consolidates, accelerates, and expands research activities that have been underway by AZI and individual zinc producers for some time. It offers promise of many improvements and new developments that should enhance zinc's position in the automotive as well as other major zinc markets.

By tradition a "workhorse metal," zinc seems to have an assured future in the automotive field. Regardless of which way the pendulums of engineering and styling swing, it will continue to play a role of major importance. Zinc, in sizable amounts, will be used for the "car of tomorrow" as it is for the car of today. ■

Trends in the

By Kenneth Rose

New Diesel Engine

International Harvester Co. has announced a new Diesel power unit, the most powerful ever built by the company, in its UDT-817 model. The six-cylinder, turbo-charged, four-stroke engine has cylinders of 5 $\frac{5}{8}$ -in. bore and 6-in. stroke for a total piston displacement of 817 cu in. With turbo-charger, it develops 385 maximum hp at 2100 rpm, and is rated 375 hp at that speed. Maximum torque is 1040 lb-ft at 1400 rpm. Compression ratio is 16 to 1.

A 24-v electrical system supplies the starting means. There is direct injection of fuel by individual camshaft-actuated, multi-orifice injectors. A twin-plunger pump meters fuel to the injectors. Dual intake and exhaust valves equipped with positive valve rotators are used. The aluminum alloy pistons are oil-cooled. Cylinder sleeves are of the wet, replaceable type. The hardened crankshaft has seven main bearings, and is equipped with a torsional vibration damper.

Accessory equipment includes air cleaners, flywheels for most leading makes of torque converters and clutches, air compressors, safety shut-offs, and instruments and engine controls for specific installations.

The engine is available for various types of construction equipment, including rubber-tired earthmoving machinery, off-highway haulers, large on-highway trucks, and other similar heavy-duty applications.

IHC Earthmoving Vehicles

Three new earthmoving vehicles also have been announced by International Harvester, and are now

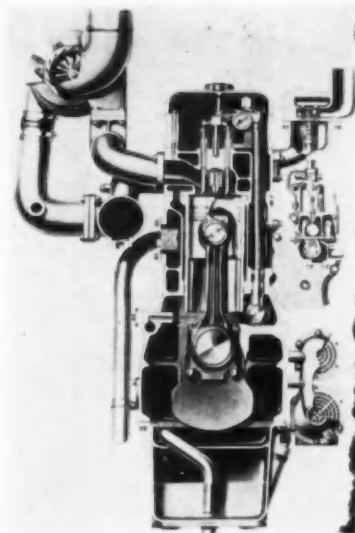
CONSTRUCTION EQUIPMENT INDUSTRY

in production. Offering increased power, capacity, and speed, the new models are the 495 Paywagon, a 27-cu-yd low-silhouette dumping wagon; the 495 Payscraper, a 24-cu-yd motor scraper with a 131-in. cutting width to its tapered bowl; and the 295 Payscraper, a 24-cu-yd motor scraper of 98-in. apron opening.

The Paywagon has a heaped capacity of 40.5 cu yd. Power-opened clam-shell doors can spot-dump the entire load, or windrow it. There is 60 in. of rear-end dumping clearance. The 495 Payscraper has a heaped capacity of 31 cu yd. The 295 Payscraper, has the same heaped capacity as the 495 model, the same cutting width, and forced ejection, but its 44-ft length gives it greater mobility than the 50-ft, 495 model. All three units are powered by the new 375-hp International 817 Diesel engine described in the foregoing.

Tractor-Scraper Combination

Caterpillar Tractor Co. has made another addition to its 1959 line with the unveiling of the No. 619



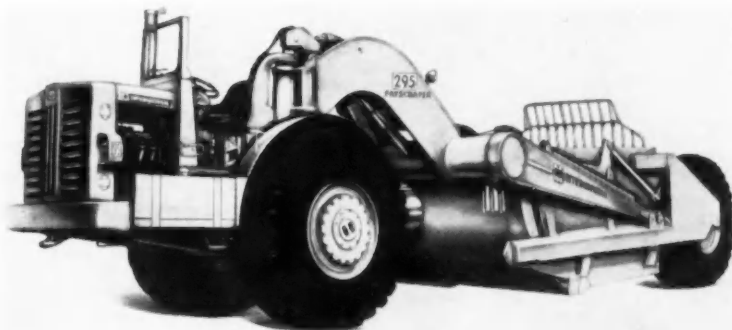
Transverse cutaway of new International 817 Diesel engine, which is rated 375 hp at 2100 rpm. Note the jet arrangement that provides oil cooling of the piston.

Tractor and No. 442 Scraper combination.

The 619 tractor is a two-wheel unit, powered by a turbocharged Diesel rated 225 hp max at 2000 rpm. Its transmission, differential, and cable control can be removed as a single unit. The tractor has a swing-away dash for ready access to the starter, air compressor, and hydraulic pump; and the entire left side of the engine can be exposed without disassembling major dash components. Clutch is a two-plate, dry type of 16-in. diam, equipped with an air asst.

The No. 442 Series B scraper has a struck capacity of 14 cu yd and a heaped capacity of 18 cu yd. It is cable operated, and has con-

(Turn to page 90, please)



International-Harvester's Model 295 Payscraper has a heaped capacity of 31 cu yd

• • INDUSTRY STATISTICS • •

WEEKLY U.S. MOTOR VEHICLE PRODUCTION

As reported by the Automobile Manufacturers Association

Make	Weeks Ending		Year to Date	
	March 28	March 21	1959	1958
PASSENGER CAR PRODUCTION				
Total—American Motors Corp.	7,137	8,538	97,368	40,586
Chrysler	1,905	1,942	17,854	15,372
De Soto	1,564	1,685	14,729	10,858
Dodge	4,566	5,672	39,851	25,557
Imperial	475	515	5,858	4,637
Plymouth	12,338	14,412	90,658	99,789
Total—Chrysler Corp.	20,848	24,226	168,950	156,213
Edsel	883	1,041	13,378	4,058
Ford	28,923	32,630	387,346	285,699
Lincoln	556	675	8,701	9,552
Mercury	1,954	2,913	43,298	35,003
Total—Ford Motor Co.	32,316	37,259	452,723	334,312
Buick	3,828	5,361	85,770	81,203
Cadillac	3,379	3,361	44,782	38,406
Chevrolet	34,564	34,488	427,654	388,978
Oldsmobile	7,445	8,918	111,263	102,325
Pontiac	8,608	8,930	112,008	75,112
Total—General Motors Corp.	57,824	61,078	781,457	686,024
Total—Studebaker-Packard Corp.	3,729	4,312	40,801	9,304*
Checker Cab.	21	124	1,457	965
Total—Passenger Cars	121,875	135,538	1,550,776	1,227,406

TRUCK AND BUS PRODUCTION

Chevrolet	7,991	7,914	97,293	73,687
G. M. C.	1,836	1,642	22,229	16,294
Diamond T	148	133	1,722	1,379
Divco	80	80	884	744
Dodge and Fargo	1,719	1,910	21,864	13,193
Ford	7,087	7,115	80,022	59,318
F. W. D.	18	6	255	375
International	3,288	3,083	31,533	27,634
Mack	292	392	4,244	3,715
Studebaker	287	325	4,231	2,730
White	407	412	4,504	4,734
Willys	2,371	2,585	28,568	19,914
Other Trucks	60	80	735	786
Total—Trucks	25,582	25,669	298,084	224,506
Buses	55	50	573	951
Total—Motor Vehicles	147,512	161,257	1,849,433	1,452,863

* Includes Packard.

1959 TRUCK TRAILER SHIPMENTS

Industry Division, Bureau of the Census

Type of Trailer	January		
	Production	Units	Value (000)
Vans			
Insulated and refrigerated	335	316	\$2,567
Steel	26	25	176
Aluminum	309	291	2,391
Semi-insulated	39	40	260
Steel	39	40	260
Aluminum	98	96	411
Furniture	70	69	275
Steel	28	27	136
Aluminum	2,266	2,151	12,107
All other closed top	835	814	2,914
Steel	1,631	1,537	9,193
Aluminum	175	158	831
Open-top	59	54	239
Steel	116	104	592
Aluminum	2,913	2,761	\$16,176
Tanks			
Non- and low pressure			
Petroleum			
Carbon and alloy steel	206	198	\$1,225
Stainless steel	17	21	227
Aluminum	175	131	1,127
Total—Petroleum	398	350	\$2,579
Chemical, food, fluid solids	41	31	\$391
All other, incl. aircraft refuelers	60	58	861
High Pressure (LPG, chemicals, etc.)	50	51	499
Total—Tanks	549	490	\$4,330
Pole, pipe and logging			
Single axle	24	24	\$36
Tandem axle	47	42	116
Total	71	66	\$152
Platforms			
Racks, livestock and stake	29	25	\$121
Grain bodies, all types	110	118	398
Platforms (flats), all types	696	682	2,327
Total—Platforms	835	795	\$2,846
Low-bed heavy haulers	165	152	\$613
Dump trailers	169	153	658
All other trailers	173	184	1,331
Total—Complete Trailers	4,875	4,601	\$26,106
Trailer chassis ¹	330	330	\$856
Total—Trailers and Chassis	5,205	4,931	\$26,962

¹ Sold separately.

NEW PASSENGER CAR REGISTRATIONS BY REGIONS

		Per Cent Change				
Zone	Region	January 1958	December 1958	January 1958	January over December	January over January 1958
1	New England	17,662	21,391	17,428	-17.43	+ 1.34
2	Middle Atlantic	73,241	89,849	71,403	-18.48	+ 2.57
3	South Atlantic	62,743	61,568	53,573	+ 1.91	+17.12
4	East North Central	93,449	132,328	88,425	-29.38	+ 5.68
5	East South Central	19,665	24,870	16,071	-20.93	+22.36
6	West North Central	38,687	50,081	34,132	-22.75	+13.35
7	West South Central	38,687	53,699	40,517	-27.63	- 4.09
8	Mountain	16,401	19,826	16,052	-17.26	+16.72
9	Pacific	58,803	64,015	46,639	- 8.14	+26.06
Total—United States		419,512	517,629	382,240	-18.96	+ 9.75

States comprising the various regions are: Zone 1—Conn., Me., Mass., N. H., R. I., Vt. Zone 2—N. J., N. Y., Pa. Zone 3—Del., D. of C., Fla., Ga., Md., N. C., S. C., Va., W. Va. Zone 4—Ill., Ind., Mich., Ohio, Wis. Zone 5—Ala., Ky., Miss., Tenn. Zone 6—Iowa, Kan., Minn., Mo., Neb., N. D., S. D. Zone 7—Ark., La., Okla., Tex. Zone 8—Ariz., Colo., Ida., Mont., Nev., N. M., Utah, Wyo. Zone 9—Alas., Cal., Ore., Wash.

1959 TRUCK FACTORY SALES BY G.V.W.

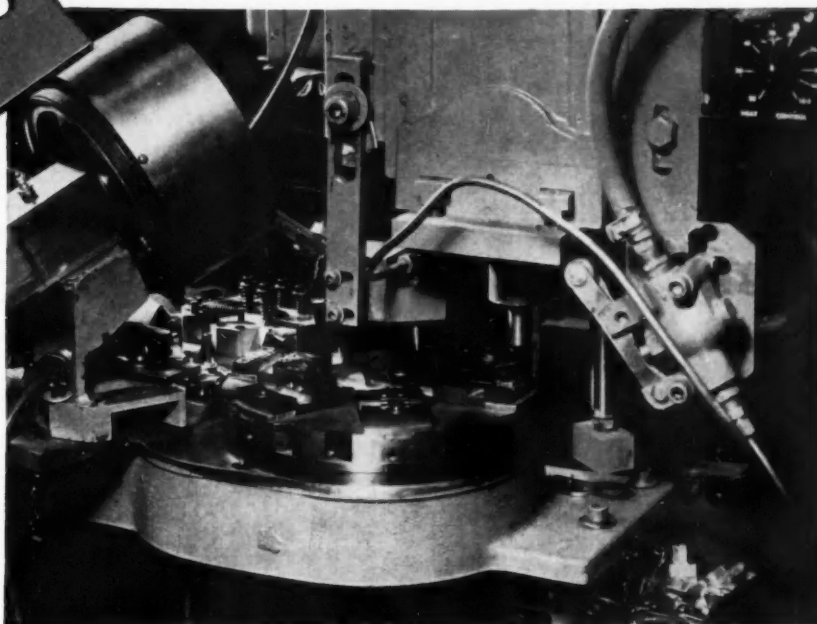
As reported by the Automobile Manufacturers Association

	6,000 lb. and less	6,001-10,000 lb.	10,001-14,000 lb.	14,001-16,000 lb.	16,001-19,500 lb.	19,501-26,000 lb.	26,001-33,000 lb.	33,000 lb. and over	Total
January	52,370	14,835	1,190	8,302	9,931	4,297	2,761	2,358	96,044
February	91,593	14,662	1,314	8,536	11,474	5,599	3,377	3,418	99,973
Total—Two Months—1959	103,963	29,497	2,504	16,838	21,405	9,896	6,138	5,776	196,017
Total—Two Months—1958	74,959	22,131	2,408	15,702	17,182	8,809	5,452	4,173	150,814

Button Contact Assembly Cost Cut 30%



Making contacts like the above ordinarily involves two hand operations—feeding contact blanks, and feeding contacts to the welding machine. New Mallory assembly method, at right, does the job faster and better, at far lower total cost.



When Mallory produces your contact assemblies, you gain the economies of specialized production techniques and machines. This new contact feeding mechanism, for example, is especially applicable to light and medium duty contact assemblies. It cuts hand operations in half, saves up to 30% of assembly cost.

Initial tooling cost of the new method is only $\frac{1}{2}$ to $\frac{1}{3}$ that of other volume production devices for this purpose . . . and changeover to different size assemblies is quickly made for as little as \$175, a fraction of the cost involved in changing other setups. Greatest savings are gained where contacts are 0.187 inches or more in diameter, backing members are 0.030 inches or more in thickness, and projections are formed on the blanks rather than the contacts.

It's ideal for producing your assemblies for small relays, auto horns and circuit breakers, voltage regulators, switches, fractional h.p. motor switches and similar applications.

Whether you need a simple contact or a complex sub-assembly, you'll find it pays to let Mallory handle the whole job . . . from design and materials selection to final assembly. You'll profit from our specialized facilities, long experience and complete service. Call or write today to have a Mallory contact expert talk over your problem.

P. R. MALLORY & CO. Inc.
MALLORY

P. R. MALLORY & CO. Inc., INDIANAPOLIS 6, INDIANA

News of the MACHINERY INDUSTRIES

By Charles A. Weinert

Machine Tool Builders Set for Big Meeting

The premiere of the Association's motion picture, "One Hoe for Kalabo," will be one of the highlights of the forthcoming 57th Spring Meeting of the National Machine Tool Builders' Association. As reported in *AI* September 30, 1958, page 130, the motion picture is an educational piece for the general public which portrays the important part played by machine tools in our everyday way of life. The title is tied to contrasting conditions in a tiny African village where it takes a whole day to make one hoe by primitive methods (no machine tools).

On the program, scheduled for April 30 and May 1 at the Statler Hilton in Detroit, is an impressive list of speakers and subjects. Besides Ralph J. Kraut, who will present the president's address, the speakers will include Brigadier General Joseph M. Colby, deputy commanding general, Army Ordnance, Missile Command, Redstone Arsenal; Niels A. Olsen, director, Metalworking Equipment Div., BDSA; plus five top officials of machine tool companies, and Ludlow King, executive vice-president of the Association. Among the subjects are "space frontier," tax depreciation, community education, 1960 machine tool exposition, and public relations, as well as several reports on industry activities of major current interest.

Around the Industry

Warner & Swasey Co.—Lester M. Cole has been elected vice-president in charge of sales. In his new position, Mr. Cole will direct all sales activities of the company's machine tool division, as well as those of the textile machinery and earthmoving equipment divisions.

Cincinnati Milling Machine Co.—Swan E. Bergstrom, president, has been awarded the honor of delivering the Eli Whitney Memorial Lecture at the annual meeting of the American Society of Tool Engineers, to be held in Milwaukee, April 18-22. The subject of his lecture will be "The History of Metal Cutting."

Morse Twist Drill & Machine Co.—the election of John J. Hayes as president, and the appointment of C. F. Duff as vice-president and sales manager of this Van Norman Industries, Inc. division have been announced by Charles F. Myers, president of Van Norman.

Super Tool Co.—a new distributor of the carbide cutting tools

Meeting of National Machine Tool Builders' Association, Scheduled for April 30-May 1 at Detroit, Promises Interesting Sessions and First-Showing of Motion Picture

produced by this Van Norman division is Sterling Supply Co., 1220 E. Nine Mile Road, Ferndale, Mich.

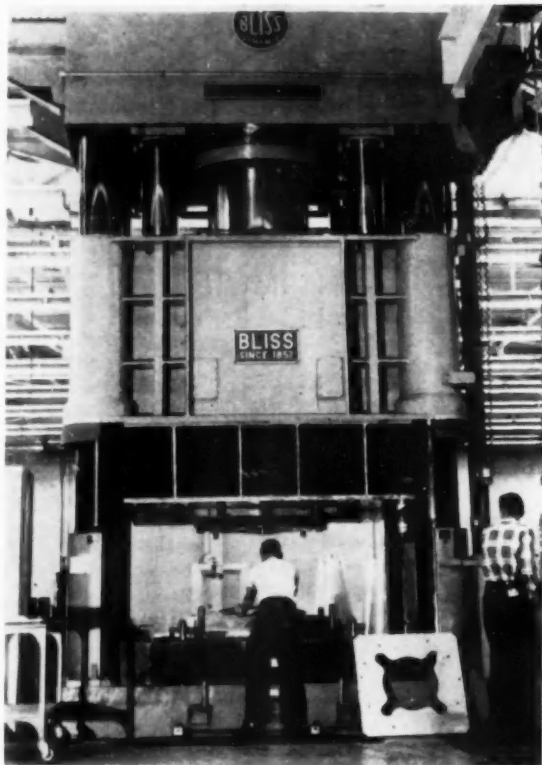
Potter & Johnston Co.—operations of the Pratt & Whitney subsidiary have been transferred from Pawtucket, R. I. to the plant of the parent company at West Hartford, Conn.

Pratt & Whitney Co., Inc.—Warren G. Bruns was recently named district manager of the company's St. Louis office.

E. W. Bliss Co.—Jack L. Kennedy has been appointed chief sales engineer of the Press Div. Harold B. Morse, who formerly held this position, recently retired after 24 years with the company.

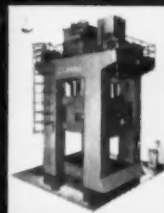
HYDRAULIC PRESS DRAWS AND STAMPS MISSILE PARTS

E. W. Bliss Co. built this versatile Hydro-Dynamic press for deep-drawing missile nose cones and for stamping other missile parts at Douglas Aircraft Co.'s Charlotte, N. C., plant. Its main slide exerts a force of 1500 tons, while the blank holder exerts a force of 600 tons. Used as a single-action press, pressure up to 2100 tons can be applied. The bed of the press is 96 by 96 in. Control is electronic, operated from a separate console. All limit switches for the cycle of the press are adjustable from the console through pushbuttons and small gear motors. Speeds of the various motions of the slides are likewise controlled at the console. The press as pictured was equipped with adapter plates for stamping large, shallow pieces.



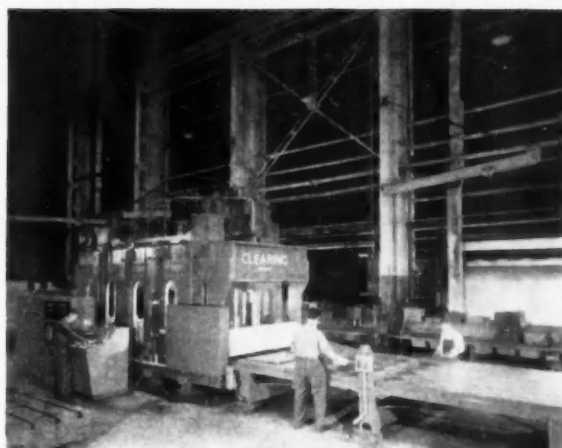
When it comes to Hydraulic Presses...

large or small

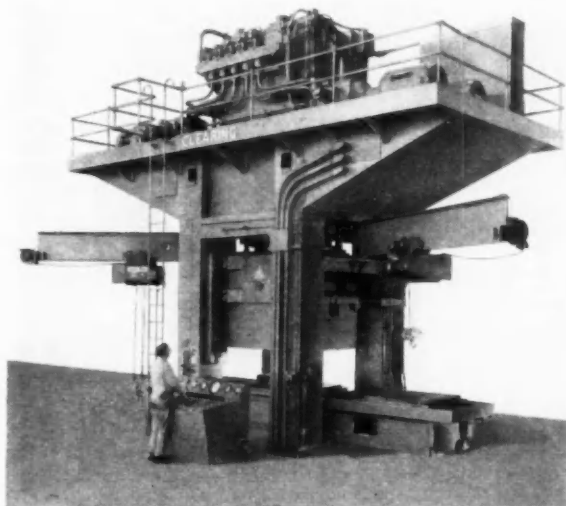


FOR ANY TYPE OF APPLICATION such as these metalworking drawing presses

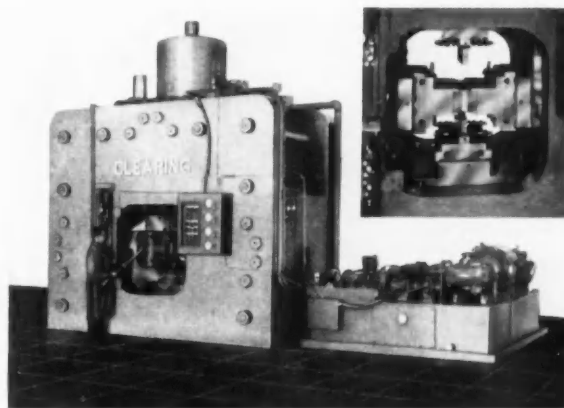
WITH SPECIAL FEEDING EQUIPMENT as shown on this metal bonding machine



WITH ANY TYPE OF CONTROLS as seen on this rubber pad forming press



AND COMPLETE WITH THE TOOLING YOU NEED FOR THE JOB as we designed and built for this briquetting press



YOU GET THE MOST PRODUCTIVE EQUIPMENT AT CLEARING

There are no limitations on the type and size of hydraulic press equipment Clearing can design and build for you. No limitations either on the creative engineering you'll find at Clearing. Working with "new" metals—titanium, tantalum, columbium, uranium, zirconium?

Clearing will have a more productive answer for you. Investigating new processes and production techniques? Call on Clearing. You'll find a forward looking team of engineers that can work with you to solve your manufacturing problems effectively and economically.

Clearing, division of U. S. Industries, Inc. also manufactures power presses of all types, dies and special tooling, and special equipment for the aircraft and missiles industry.



Clearing

DIVISION OF U.S. INDUSTRIES, INC. 6499 W. 65th Street • Chicago 38, Illinois

The BUSINESS PULSE

Further Increase in Gross National Product Seems Assured for Second Quarter of Year. Third-Quarter Rise May Be Moderate with Better Upturn Foreseen for the Fourth Quarter of 1959.

The record for the first quarter of the year is generally good, apart from the sluggish conditions which prevailed in labor markets. Both gross national product and industrial production registered satisfactory gains about in line with previous expectations. The combination of high consumer spending, the resumption of inventory accumulation, strength in residential construction, and a turnabout in plant and equipment outlays pushed GNP to an annual rate of about \$464 billion in the first quarter, \$11 billion above the rate in the final quarter of 1958.

Uptrend in Second Quarter of Year

A further increase in GNP seems virtually certain for the second quarter of the year. In the consumer area, the uptrend currently under way in personal income strongly suggests a higher level of expenditure in the months immediately ahead. In the business sector, an increase during the second quarter in plant and equipment outlays is indicated by the latest Government survey data, and there would also seem to be a good possibility of a further advance in the rate of inventory accumulation. The special impetus provided by the threat of a steel strike will continue to affect inventory policy through the second quarter, and in addition there will probably be growing emphasis by businessmen on the more normal type of inventory rebuilding.

Apart from these specific expansive tendencies, there is also a more general reason for expecting that GNP will continue to advance in the period immediately ahead. This is simply that the recovery move-

This Survey, published for the readers of automotive magazines exclusively in **AUTOMOTIVE INDUSTRIES**, has been prepared by the **Guaranty Trust Company of New York**

ment has not as yet produced any demonstrable distortions or excesses in the economy. And, so long as this is true, there will be prospects for continuing gains, since in a healthy environment each new phase of expansion—accompanied as it is by a higher flow of payments—tends to beget still more expansion.

Given present tendencies, it does not seem unreasonable to expect a gain in GNP during the second quarter of, say, from \$7 billion to \$9 billion at an annual rate. Such a gain in the second quarter would raise the annual rate of GNP to \$470 billion or more. This projection is generally in line with the thinking of Government economists at present.

Plant and Equipment Spending

What will happen after the second quarter is a much more speculative matter, with the answer depending in considerable part on how prospects are viewed for plant and equipment expenditures. Will the uptrend which now seems to be developing in investment outlays continue after the middle of the year, or will the movement taper off?

The second alternative seems more probable if the results of the latest Government survey of businessmen's investment intentions are

taken at face value. These findings point to about the same annual rate of plant and equipment spending in the second half of the year as in the second quarter. And this prospect has caused some analysts to conclude that the general business pattern may be somewhat sluggish in the second half. This conclusion arises from the belief that buoyancy in investment will be necessary to compensate for an expected leveling out and perhaps some moderate decline in residential construction expenditures and Federal Government purchases.

There would seem to be a serious question, however, as to whether the survey findings should in fact be taken at face value. Certainly in the past it has been typical for cyclical recovery in investment spending, once under way, to continue so long as the general economic situation is healthy. It should not be forgotten, moreover, that comparable survey findings in 1955 "forecast" a substantially lower level of investment spending for the second half of that year than actually occurred, nor that comparable data in 1950 "forecast" a decline in second half spending instead of the considerable rise which occurred. Both of those years, like the present, followed recessions and were years of rising economic activity. Thus, there is good reason to believe that the survey approach may have a downward bias at such times.

Improving Profits Situation

Because of these considerations and because of the improving profits situation (which provides the means for accelerated investment

(Turn to page 94, please)

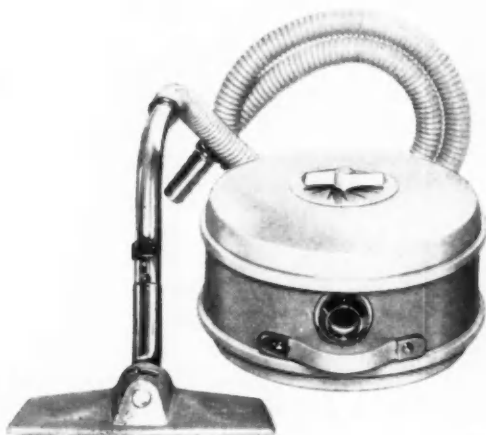
*Inland "job-tailored"
Cold Rolled Sheets work better*

product: VACUUM CLEANER
TANK PART



problem:

produce a handsome vacuum cleaner tank of the upright type, designed in a silhouette for consumer eye appeal. The operation to be a single deep draw. Because of the depth of the draw and the severe shaping, a sizeable amount of breakage could result. The required draw also produced stretcher strains in the shaped tank which handicapped later finishing operations.



solution:

quality standards were met and the problem overcome by "job-tailored" Inland Cold Rolled, Drawing Quality, Aluminum Killed Steel. This steel, specifically recommended for the job, successfully took the deep draw and pattern formation required. Stretcher strains were eliminated and an excellent surface obtained for all subsequent finishing.

INLAND STEEL

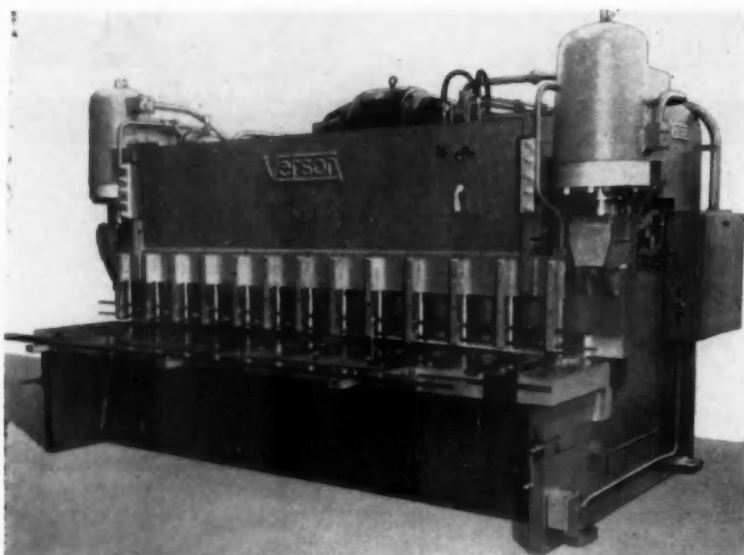
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Sales Offices: Chicago • Davenport • Detroit • Houston • Indianapolis
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*Cold
Rolled
Sheets*

NEW**PRODUCTION
and PLANT****EQUIPMENT**

FOR ADDITIONAL INFORMATION, please use reply card at back of issue



Verson No. HPS-750-12 hydraulic shear with capacity of 12 ft lengths of $\frac{3}{4}$ in. mild steel

Hydraulic Shears Equipped With Automatic Control

A LINE of hydraulic shears is available with shear capacities of standard models ranging from 8 ft lengths of $\frac{3}{8}$ in. mild steel, through 12 ft lengths of $1\frac{1}{2}$ in. mild steel. Special capacities are available to meet any requirement.

The shears are designed with a minimum shear angle of $11\frac{1}{6}$ in. per ft, eliminating curling of the sheared piece. All shears are equipped with automatic control to keep the ram op-

erating at a predetermined shear angle. This angle is adjustable by a handwheel located at the operator's station.

A stroke control, with limit switches both top and bottom, is adjustable through the entire range of the stroke. When narrow pieces are sheared, the stroke can be shortened to obtain greater productivity. Verson Allsteel Press Co.

Circle 30 on postcard for more data

Blast Cleaning Cabinets

SPINNER hanger cabinets are designed to meet the needs of specific cleaning applications but their essential features include compartmented work areas, spinner devices for rotating the work while it is being blasted, airless blast units, and work-carrying fixtures.

Indexing arrangements turn the compartments so that one is always exposed to the operator for loading and unloading. Blasting can be achieved in one or several stages, de-

pending on requirements, and is continuous in operation. The size of the machine can be varied to handle virtually any sized part. Wheelabrator Corp.

Circle 31 on postcard for more data

Heavy Duty Drive Tool

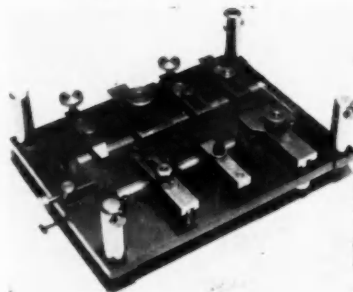
THE size 5U-HD heavy duty Impactool delivers 1900 impacts per minute and runs at a free speed of approximately 1900 rpm. It measures

$10\frac{1}{2}$ in. in length and weighs 6 lb, 4 oz, less cable, and is available for 110 or 220 v operation AC-DC.

Although developed primarily for automotive nut running use, the 5U-HD is also a multi-purpose tool. With standard attachments it will drive, drill, drive screws, ream, tap, do wire brushing, hole sawing, etc. Ingersoll-Rand Co.

Circle 32 on postcard for more data

Jig, Fixture Plates



PIC Design Corp. is offering a complete line of stock precision ground jig and fixture plates. The plates, $\frac{3}{16}$, $\frac{1}{4}$, $\frac{3}{8}$ or $\frac{1}{2}$ in. thick, are available in stainless steel or aluminum. All surfaces are flat and parallel to within ± 0.0005 in., with an overall 32 micro inch ground finish.

Circle 33 on postcard for more data

Drill Detector Unit

A PNEUMATIC drill detector unit for use with multiple or single station automatic drilling machines that "spots" broken and missing drills and supplies a signal for machine shutdown is available.

The device is unaffected by dirt or coolant. It detects the presence or absence of a drill or similar tool by means of a stream of air playing against each drill as the drill enters or is retracted from the workpiece. A broken or missing drill causes a pressure drop in the circuit which, in turn, initiates an electrical impulse to operate signal lights and relays. The unit operates off the regular factory air line and 110 v, 60 cycle A-C. The Sheffield Corp.

Circle 34 on postcard for more data
(Turn to page 67, please)



MIDLAND

MIDLAND COMPRESSOR — Heart of Midland Air Power Systems

Midland products include:

Air brakes for the truck and trailer industry
Vacuum power brakes for the automotive industry
Equipment for the Transit industry
Control devices for the construction industry
Midland Welding Nuts for assembling metal parts

Write for detailed information



**MIDLAND-ROSS
CORPORATION**

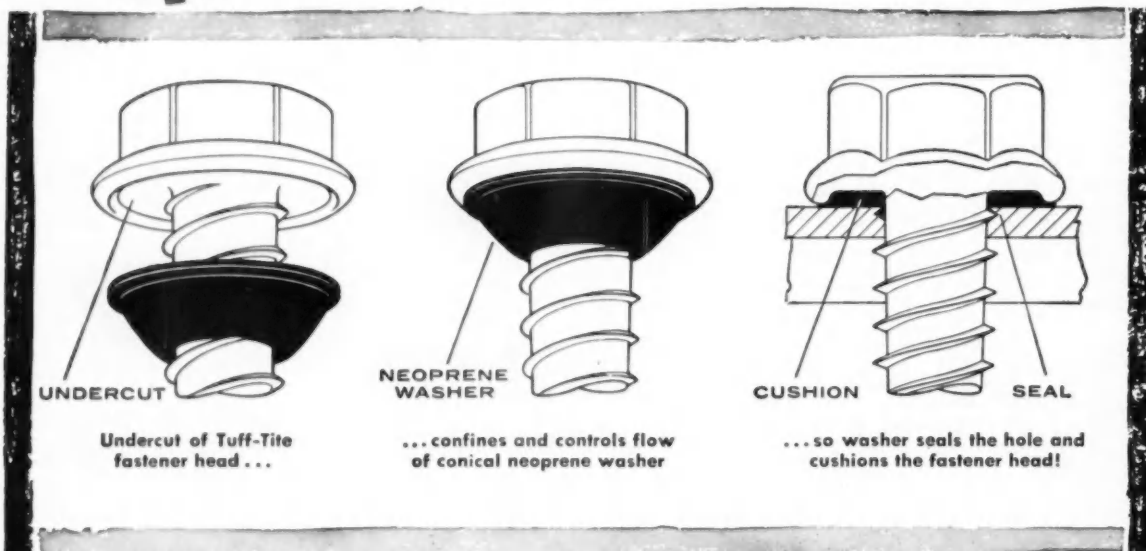


Owosso Division • Owosso, Michigan
ONE OF THE "400" LARGEST AMERICAN CORPORATIONS



For better products

LEAKPROOF...CUSHIONED TUFF-TITE® FASTENERS



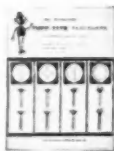
Now you can • prevent leaks at fastener holes

- protect fine finishes from fastener damage
- stop vibration noises and squeaks

It's the combination of undercut head design and tough, conically shaped neoprene washer that makes Tuff-Tite fasteners work. The undercut helps confine and control spread of the neoprene washer as it is compressed. The washer's conical shape causes it to flow into top threads and seal the fastener hole.

Tuff-Tite fasteners won't mar fine finishes and they stop vibration noises and squeaks because the neoprene washer spreads itself completely between fastener head and surface. The washer actually cushions the fastener and prevents metal-to-metal contact.

Leakproof, non-marring, shock and squeak absorbing!
If you need these fastening advantages, you need National Tuff-Tite fasteners. Write for the Tuff-Tite fastener folder describing this line in detail.



THE NATIONAL SCREW & MFG. COMPANY CLEVELAND 4, OHIO

Pacific Coast: National Screw & Mfg. Co. of Cal.
3423 South Garfield Ave., Los Angeles 22, Cal.

Tuff-Tite fastener facts

Standard National Tuff-Tite fasteners are available in hexagonal, pan, round and truss head styles for screw diameters No. 6 to $\frac{3}{8}$ " inclusive ... maximum over-all length $1\frac{1}{2}$ ". Standard fastener types are wood screws, self-tapping screws, thread cutting screws, machine screws and stove bolts. Tuff-Tite fasteners are pre-assembled with neoprene washers.

Washers are molded of neoprene which has a durometer hardness of 85 to 95.

Write for information on *special* Tuff-Tite fasteners.



Fasteners



Hodell Chains



Chester Hoists



protection is stainless steel

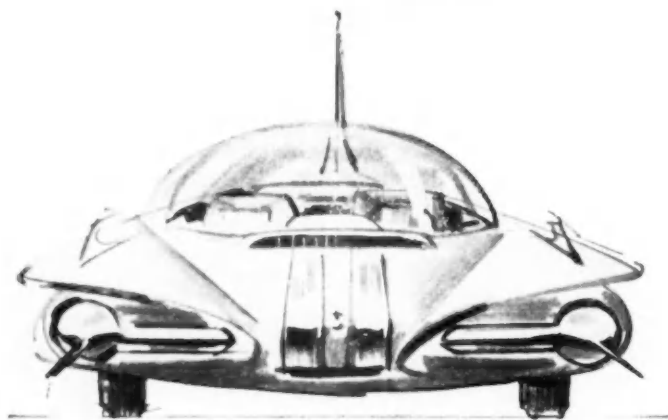
Summer or winter the car with plenty of Stainless Steel
is easy to clean and keeps its good looks
under the roughest conditions of driving and weather.

No other metal offers the freedom of design and fabrication,
economy of care and the durable beauty that serves
and sells like Stainless Steel.

McLOUTH STEEL CORPORATION, Detroit 17, Michigan



specify
McLOUTH STAINLESS STEEL
HIGH QUALITY SHEET AND STRIP
for automobiles



PUROLATOR'S DRY TYPE AIR FILTERS GIVE

COMPLETE DESIGN FREEDOM



With Purolator's new dry type air filters, there's no need to keep a constant, level bearing . . . to set the air cleaner on top of the block. There is no oil to spill, no level to be maintained. This makes it possible to place the filter anywhere at all . . . under the engine, on the side . . . wherever it allows the most design freedom.

Of course, the big advantage in dry type filtration is

the optimum efficiency it affords. The Micronic dry type element is just as effective at low speeds as at high speeds. And instead of becoming less efficient with use, its already outstanding 99% efficiency *increases* to 99.7%.

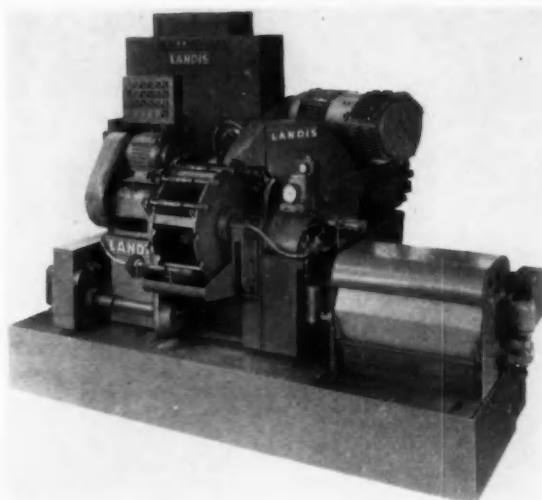
Design your cars the way you want them . . . then call on Purolator to design and produce the air filter to fit your design.

Filtration For Every Known Fluid

PUROLATOR
PRODUCTS, INC.

RAHWAY, NEW JERSEY AND TORONTO, ONTARIO, CANADA

Cylindrical Production Grinder



Landis R plunge grinders are designed for production infeed grinding cylindrical work with completely automatic operation, and are available with straight or angular wheel heads. A formed grinding wheel or several grinding wheels can be used. This makes it possible to grind a face and several diameters in one operation. Scrap and rework is said to be practically eliminated. (Landis Tool Co.)

Circle 35 on postcard for more data

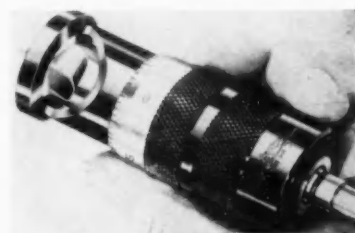
The pull-back is actuated by a multiplier, consisting of a gear, rack and cam, connected by a rod to the press ram below any possible breaking point. The multiplier is geared to a 7 to 1 ratio on the first part of the stroke, providing efficient operation on short stroke presses, or for spring die or drawing applications. *The Positive Safety Mfg. Co.*

Circle 36 on postcard for more data

Micro-Stop Countersink

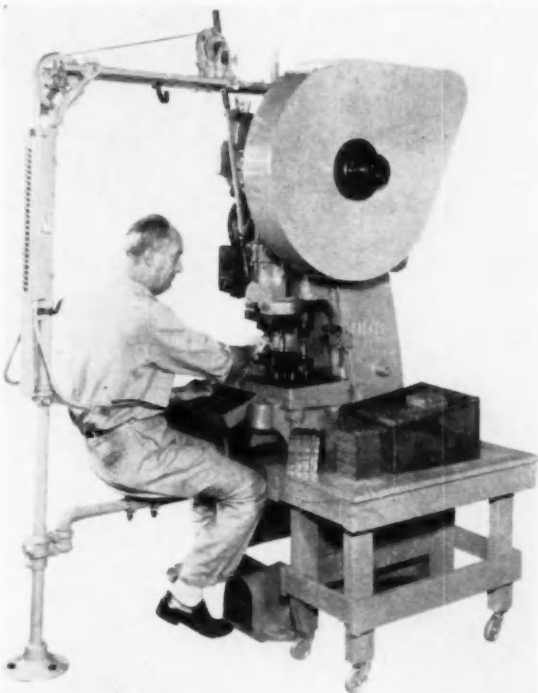
THE Schrillo Micro-Stop countersink is capable of making precise depths of cut within fixed limits of ± 0.001 in. for countersinking, deburring, chamfering, trepanning or removing collars from Hi-Sheer rivets. Powered by hand drill, drill press lathe, etc., it may be used continuously without excessive heating.

Finger-tip adjustment to increments of 0.001 in. is made, without use of tools, by retracing and rotat-



Schrillo micro-stop countersink

Pull-Back Safety Device Adaptable to Many Operations



The Possons safety device can be floor mounted or suspended either from the ceiling or a beam which extends out from the top of the press. Wrist bands can be furnished in leather or high-strength nylon webbing.

POSSONS pull-back safety devices, originally designed for protection of punch press operators, are adaptable to toggle presses, embossing presses, press brakes and drophammers, as well as many special machines.

Ordinarily the operator, after placing the stamping between the dies, moves his hands to a safe position

when reaching for material. If he should fail to do so, the Possons safety device physically pulls his hands away before the press ram nears the pinch point. There is no jerk or pull unless the operator is in danger.

This pull-back action is performed by steel cored cables, fastened to wrist bands on the operator's hands.

ing the spring-loaded thimble to any desired position. The Vernier scale is clearly marked for easy reading and machine cut serrations provide positive locking and prevent accidental variation in depth of cut. *Schrillo Acro Tool Engineering Co.*

Circle 37 on postcard for more data

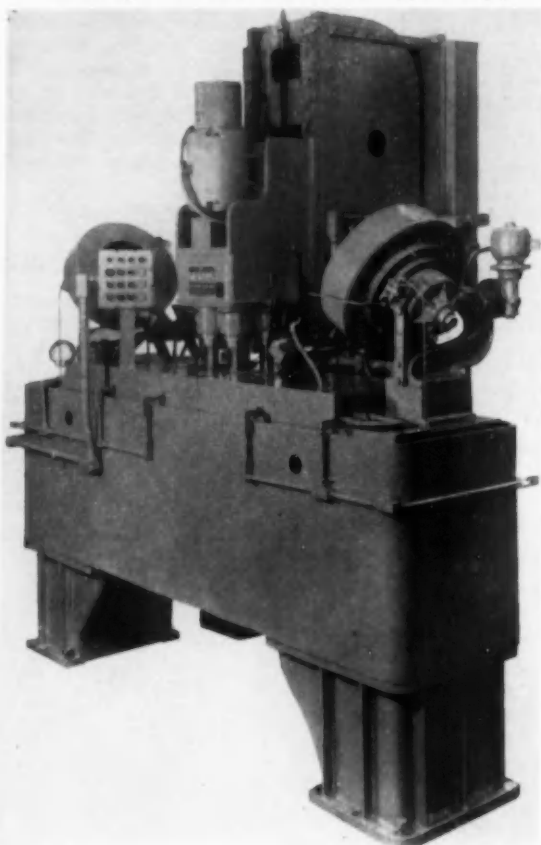
Headed Parts Feeder

AUTOMATIC and continuous feed, transfer or assembly of headed parts are provided by the Model 700 Feedall. It has electric control with variable speed from 10 to 20 strokes per minute. The machine feeds sliding parts $\frac{1}{8}$ to 1 in. in diameter from 1 to 4 in. long; headed work, same diameters, $\frac{1}{2}$ to 3 in. long. The hopper capacity is $1\frac{1}{2}$ cu.-ft.

Measuring 18 by 28 in. overall and 19 in. high, the unit is readily portable and power is entirely self-contained. It uses a $\frac{1}{4}$ hp 220/440 v 3-phase motor. An overload safety system is built-in to protect moving parts from damage. *Feedall, Inc.*

Circle 38 on postcard for more data
(Turn to page 68, please)

High Production Unit-Type Tapping Machine



Completely automatic tapping operation is featured on a unit-type tapping machine, Model 409-S. Designed to process 1/2 in. electrical conduit locknuts, the four-spindle machine selects, positions, loads, taps and ejects 1215 pieces per hour at 80 per cent efficiency. Units are available for 3/4, 1, 1 1/4, 1 1/2, and 2 in. size locknuts. The machine consists of a vertically mounted four-spindle individual lead screw tapping unit, two motorized hoppers and feed mechanisms, and four fixtures, all mounted on a common cast iron base with a platen face machined on top. These components are lubricated automatically with an oil mist lubricating system. (The Morris Machine Tool Co.)

Circle 39 on postcard for more data

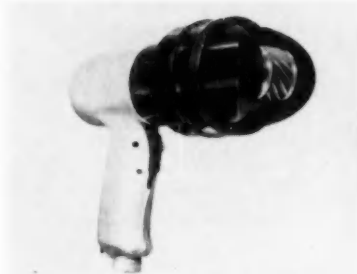
justable die stroke of 12 1/2 to 18 1/2 in. Die plates measure 47 by 46 1/2 in., giving 28 1/2 by 28 1/2 in. clearance between tie bars. Locking pressure is 600 tons.

Shot cylinder on the machine is provided with an adjustable slow start to allow complete venting of sleeve and runner system. To accommodate different length sleeves, the shot cylinder stroke is adjustable in a six inch range of initial phase of stroke, making complete stroke adjustable from 14 to 20 in. Reed-Prentice Div., Packaging Machinery Co.

Circle 40 on postcard for more data

Portable Weld Shaver

REMOVAL and finishing of weld beads by multiple grinding and sanding operations may be performed in one operation with the Weld



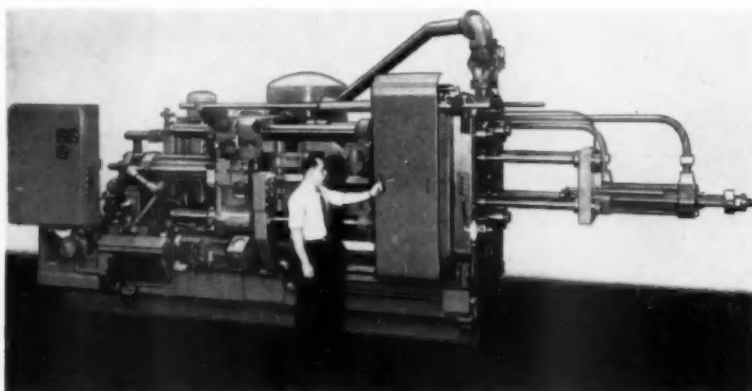
Zephyr Model ZT508 weld shaver.

Shaver, developed by Zephyr Mfg. Co., Inc.

Designed primarily to meet the needs of the aircraft and missile manufacturing industry, the device uses a rotary cutter to remove excess filler and shave weld beads to surface plane. The cutter is mounted between adjustable rollers which straddle, and follow, the weld bead on flat, convex or concave surfaces.

Named the Model ZT508, the shaver is for use on stainless steel, steel and titanium welds and is geared to operate at 3000 rpm. It is 11 1/4 in. long and weighs 9 1/2 lb.

Circle 41 on postcard for more data



Reed-Prentice 600-ton die casting machine for cold chamber die casting

600 Ton Machine For Cold Chamber Die Casting

A 600-TON die casting machine, designed for all types of cold chamber die casting, utilizes hand ladling, automatic ladling or automatic feeding through the Reed Vacufeed system. The Vacufeed method com-

bines automatic feeding with automatic die casting, attaining speeds equal to those in zinc die casting.

Aluminum die castings weighing up to 10 lb can be produced on this 600TDA machine which has an ad-

Rigid Boring Bar

THE two-piece draw bar construction of a boring bar designed by the W. D. Allen Mfg. Co. pre-stresses the bar and eliminates the normal deflection that takes place in application. The bars are said to be suited for bottom boring and internal threading.

Circle 42 on postcard for more data
(Turn to page 70, please)

A Fundamental Part of Automotive Engineering



BURTON SPRINGS

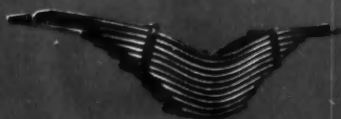
FOR MOTOR CARS



TRUCKS • BUSES



TRACTORS ... TRAILERS



OFF HIGHWAY



Between the road and load, few major auto parts are as vital as **SPRINGS**. To a large degree, they equalize and distribute stresses and strains, soften shock, level the ride, protect the vehicle, the loading, and the pavement itself. The proper selection and design of **SPRINGS** is a fundamental part of automotive engineering.

Almost every prominent builder of trucks, trailers, tractors, buses, motor cars and off-highway equipment uses **BURTON** leaf and coil springs, specially engineered and specified as original components.

Burton Spring Engineers are ready to work side-by-side with your technical people toward a practical solution of your spring problems.



**YOUR INQUIRY WILL RECEIVE PROMPT
AND THOUGHTFUL ATTENTION**

BURTON

AUTO SPRING CORP.

WESTERN AVENUE AT FORTY-EIGHTH STREET • CHICAGO 32, ILLINOIS

Power Presses With Pneumatic Friction Clutch



A line of power presses with a pneumatic friction clutch and brake has been designed by Famco Machine Co. Ranging in size from 6 to 18 tons in bench and floor models, the presses have a heavy, semi-steel, closed grain cast frame, one-piece heat treated crankshaft, full halved bronze bearings at the main bearing, and a precision-fitted ram block, insuring perfect alignment. The clutch and brake is a high torque, low inertia unit, and is self-compensating for wear. (Famco Machine Co.)

Circle 43 on postcard for more data

completely automatic and an operator is not required.

Parts are gravity fed to the machine load mechanism. A hydraulic cylinder strips each part out of the load system and moves it forward into drilling position. Then two gear teeth straddle a single guide rail which provides radial positioning for hole locations. The hydraulic cylinder also acts as a clamp during the drilling operation. And a disappearing locating pin in the center of the part provides a bearing surface for machining thrust. All hydraulic, electric and pneumatic components conform with JIC standards. F. Jos. Lamb Co.

Circle 44 on postcard for more data

Pneumatic Screwdriver

SHOWN is the 400-RSP reversible pneumatic screwdriver equipped with a pistol-grip and a trigger throttle.

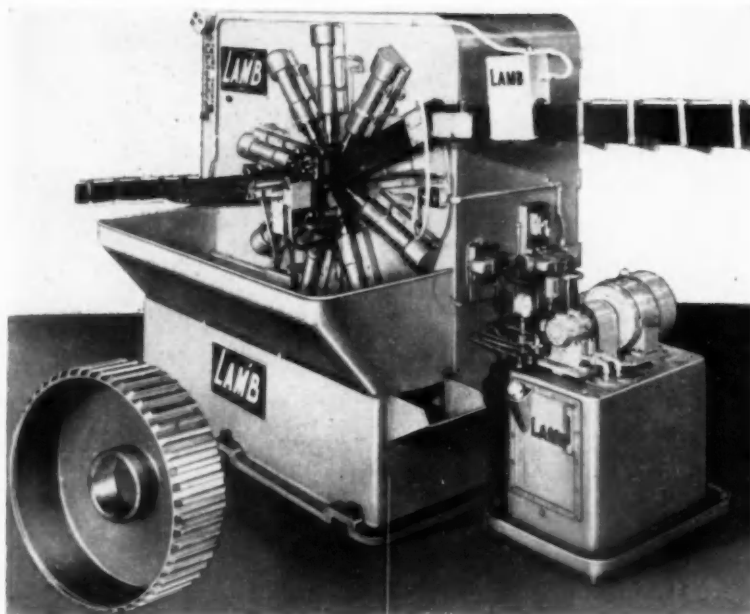
Anti-friction type bearings are featured in the entire line to insure long



Airetool Model 400-RSP pneumatic screwdriver has an oil reservoir with eight hours capacity of intermittent operation with one filling.

wear, trouble-free operation. All models are furnished with either adjustable clutch, positive clutch or direct drive and are available in four speeds. Airetool Mfg. Co.

Circle 45 on postcard for more data



F. Jos. Lamb machine drills 4320 holes per hour in transmission parts

Unit Drills 4320 Holes Per Hour In Transmission Parts

NINE 0.090 in. diam oil holes, equally spaced around the periphery of automatic transmission clutch hubs,

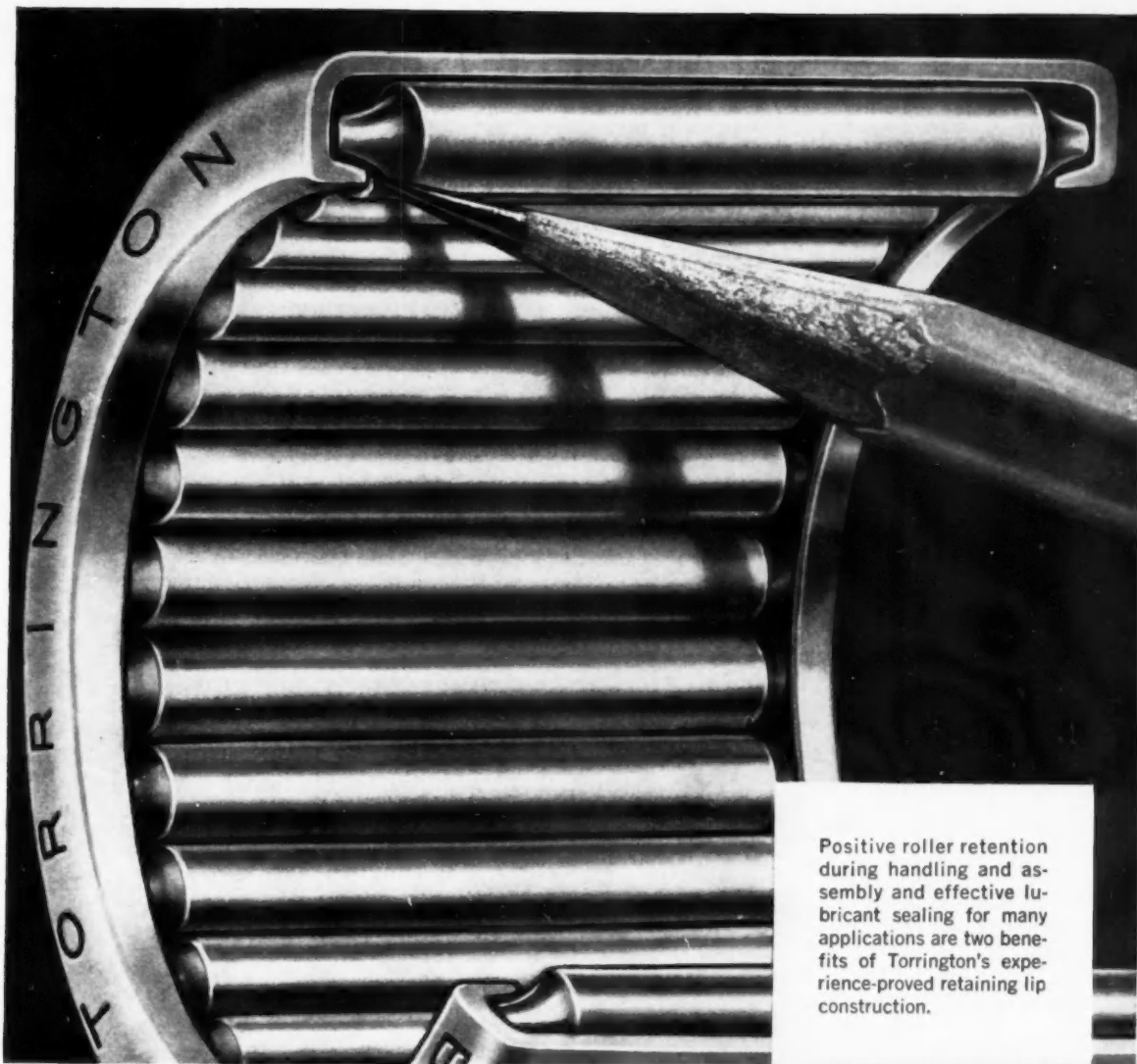
can be drilled simultaneously on this machine. The production rate is 480 parts per hour. Machine operation is

Rotary Table

AN 11 in. rotary table, which reads to 1 second and has an overall performance accuracy of ± 2 seconds throughout the entire 360 degrees, has been introduced by Moore Special Tool Co., Inc.

The table, named the Model No. 2 Moore Ultra-Precise rotary table, was developed to meet the demand for more precise angular spacing. This is achieved through the use of a non-disengageable, thread-ground worm in combination with the accurately spaced teeth of its mating gear.

Circle 46 on postcard for more data
(Turn to page 72, please)



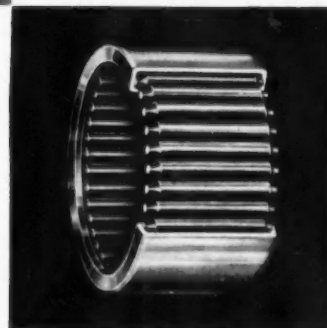
Positive roller retention during handling and assembly and effective lubricant sealing for many applications are two benefits of Torrington's experience-proved retaining lip construction.

This little lip makes a big difference!

The turned-in lip at each end of Torrington Needle Bearings positively retains the trunnion - end rollers and makes the bearing truly a complete unit, with no possibility of roller fall-out.

This unit construction simplifies installation and servicing. The closely controlled clearance and the large area between cup lips and shaft form an effective labyrinth seal. Also this retaining lip allows pregreasing the bearing with the proper lubricant for each application.

Long experience with the Torrington Needle Bearing in thousands of applications has proved the merit of this and other features in efficient performance and long service life. Make sure your product benefits from the best that experience has to offer—specify Torrington Needle Bearings. The Torrington Company, Torrington, Conn.—and South Bend 21, Ind.



Visit Torrington
Design Engineering Show
Philadelphia • May 25-28

TORRINGTON BEARINGS

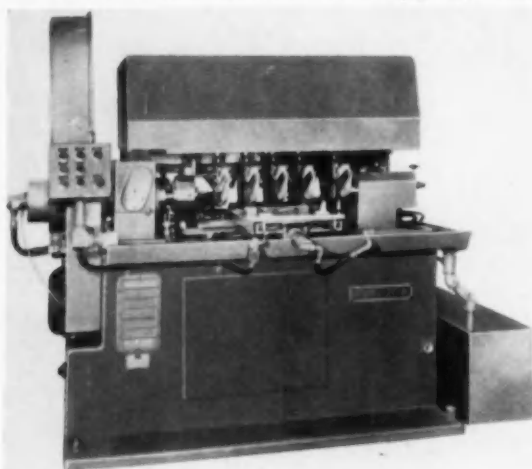
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NEEDLE • SPHERICAL ROLLER • TAPERED ROLLER • CYLINDRICAL ROLLER • NEEDLE ROLLERS • BALL • THRUST

AUTOMOTIVE INDUSTRIES, April 15, 1959

Circle 134 on Inquiry Card, for more Data

Automatic Machine for Lapping or Roll Burnishing



The Footburt-Schraner Model SFA is a completely automatic unit for lapping or roll burnishing bearing surfaces on straight shafts or camshafts. Equipped with automatic loading and unloading devices, it handles shafts up to 36 in. long and with a maximum outside diameter of 12 in. Shafts with bearing surfaces $\frac{1}{2}$ in. wide or more, and with at least $1\frac{1}{4}$ in. between centers can be accommodated. Maximum bearing OD with standard lapping heads is three inches. (The Foote-Burt Co.)

Circle 47 on postcard for more data



RCA hardness checker tests up to 2500 parts per hour automatically

Machine Automatically Checks Parts for Hardness

THIS machine automatically checks parts for hardness using RCA's electronic gaging system.

Parts are automatically or manually oriented and positioned on the conveyor which carries them to the checking station where they are transferred one at a time to the hardness-checking penetrator. A standard minor load is applied and a clutch sets the gage to zero. Then a major load is applied. The depth of penetration causes changes in the gage head

which are taken off and converted to a smoothly varying direct current proportional to the degree of hardness. Signal lights on the control panel give a continuous presentation of the entire operation. Radio Corp. of America.

Circle 48 on postcard for more data

Power Sweeper

TRAVELING at speeds up to 5 mph, this Model 53 rider-type power

sweeper cleans a path 28 in. wide (40 in. wide with sidebrush). The operator's hands are always free to steer the unit due to dual foot pedal controls that eliminate hand shifting. The left pedal permits change from



Tennant rider-type power sweeper

forward to reverse and the right pedal regulates sweeper speed and brake action.

Sweeper brushes are cylindrical and can be changed in five minutes. They are available in either fiber, wire, or combinations of each. The machine is powered by a 7 hp air-cooled engine, turns in a 60 in. radius, and has overall width of 42 in. (including sidebrush). It has front wheel drive through $\frac{1}{2}$ in. roller chains. G. H. Tennant Co.

Circle 49 on postcard for more data

Heavy Duty Power Drills

WHITMAN & BARNES announce a complete line of short length, heavy duty power drills. The drills are particularly suited for use in portable electric drills and in the drilling of sheet metals, stainless steel, monel metal and other hard materials.

Factory pointed with 135 degree



Whitman & Barnes heavy duty power drills

split points, they are available in fractional, wire gage and letter sizes and in sets. Whitman & Barnes.

Circle 50 on postcard for more data
(Turn to page 75, please)



THE LARK

BY STUDEBAKER

Your new dimension in motoring



TESTED AND APPROVED

for all Studebaker-Packard KromeX replacement sets

STAINLESS STEEL OIL RINGS
in all
Studebaker-Packard
KromeX Piston Ring Sets
The new dimension in oil control

KromeX piston ring sets with stainless steel oil rings* deliver unmatched oil control and last longer for these 5 reasons—

- ① Easy to install
- ② Seat instantly
- ③ Hold their fit in the cylinder
- ④ Maintain their original tension
- ⑤ Chrome-plated side-rails for extra life

For outstanding performance, every KromeX set also has chrome-plated top compression rings.

• Positive blow-by control • Factory-lapped for instant seating • Long life

*Manufactured by Sealed Power Corporation, Muskegon, Michigan



PRECISION BUILT PRODUCTS

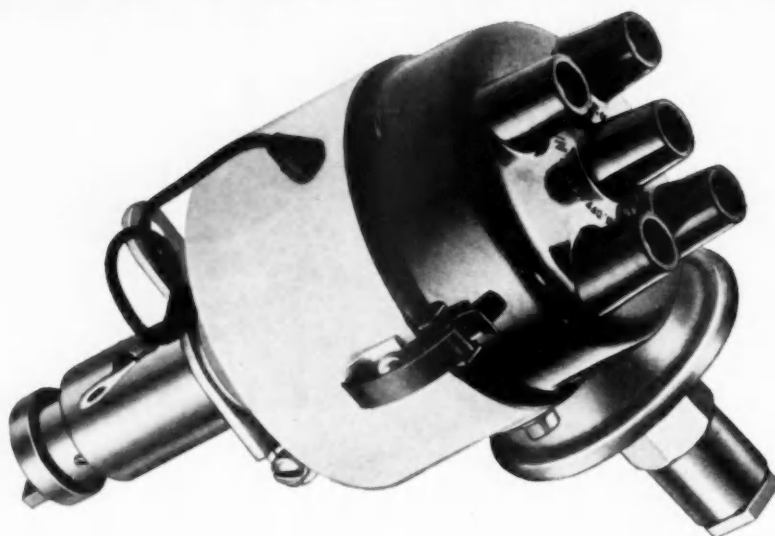
Parts and Service Division

STUDEBAKER-PACKARD CORPORATION

SOUTH BEND 27, INDIANA AND ZONES

NOW...FROM AUTO-LITE

SIX NEW IMPROVEMENTS IN DISTRIBUTOR DESIGN



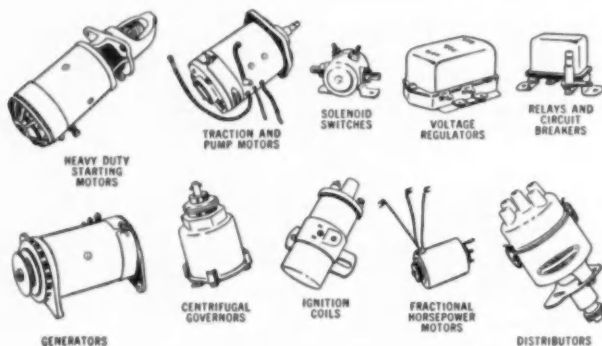
NEW COST REDUCTION SERVICE FOR MANUFACTURER CUSTOMERS

Programs that include design, engineering, methods, automation and manufacturing are all contributing to the important new cost reduction service of the Electrical Products Group of Auto-Lite. Included are greatly expanded research and engineering activity, facilities for field training and servicing and District Managers prepared to assist customers and prospects in their drive for lower costs.

Now Auto-Lite offers a completely new distributor design. Ignition engineered for 4-, 6- and 8-cylinder automotive and industrial applications, this new, low friction governor distributor is extremely rugged and dependable. Here, for example, are just six of the many advantages of this new distributor:

1. Weight savings of approximately 40% over most other designs
2. Non-corrodible distributor bowl that is salt spray resistant and unaffected by marine and tropical environment
3. Low hysteresis governor advance design for high accuracy of calibration of speed versus spark advance
4. Glass-filled high temperature resin base molded around a powdered iron bearing pedestal
5. Long life lubricated sintered iron cam element and weight element
6. Lubricant capacity six to eight times that of conventional oilers means long life lubrication for the distributor bearings

This unit is available in either vacuum or non-vacuum types and with a variety of precisely engineered seals to prevent penetration of dust, water, or oil.



AUTO-LITE®

**ELECTRICAL PRODUCTS
GROUP**

THE ELECTRIC AUTO-LITE COMPANY, TOLEDO 1, OHIO

AUTO-LITE ENGINEERS ASSIST CUSTOMERS IN THEIR DRIVE FOR PROVEN QUALITY AND LOWER COSTS



Design engineers, purchasing agents and cost-conscious management men in all areas have been quick to take advantage of the new Cost Reduction Program announced by Auto-Lite's Electrical Products Group.

In recent months Auto-Lite Electrical Products Group engineers have traveled thousands of miles to assist customers in their new product development programs.

Typical example of new service

Typical of this service was the recent flight of Syracuse Division Chief Engineer Art Kaiser to a customer's headquarters in order to confer with engineers working on 1960 models. All it took was this customer's "YES, we would appreciate having one of your engineers take a look at this" and 24 hours later Mr. Kaiser was on hand to add his experience to this customer's engineering staff.

How you can take advantage of this Service

As a part of the new Auto-Lite Cost Reduction Service, the Electrical Products Group District Managers are at your service. They can tell you how Auto-Lite can make available to you the skills and know-how of its 19 engineering and research laboratories, its manufacturing facilities, and its nationwide service organization. They can help you with your cost reduction and product improvement programs.

THE ELECTRIC AUTO-LITE COMPANY ELECTRICAL PRODUCTS GROUP • TOLEDO 1, OHIO

Please send me further information on . . .

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| <input type="checkbox"/> Distributors | <input type="checkbox"/> FHP DC Motors |
| <input type="checkbox"/> Pump & Traction Motors | <input type="checkbox"/> Generators |
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| | <input type="checkbox"/> Oil Filled Coils |

Name _____

Company _____ Position _____

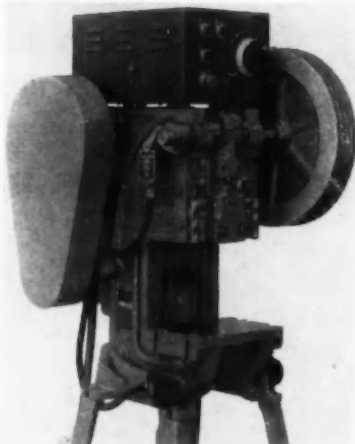
Address _____

City & State _____

Circle 136 on Inquiry Card, for more data

Safety Engineered Press

THE eight ton Electro-Safe punch press is designed for safe, economical operation. Using the press for



Kenco eight ton Electro-Safe punch press

single-trip operation, the operator must depress two widely separated hand controls, and hold until the ram reaches the bottom of the stroke. The operator cannot fasten one control in the "down" position—both must be depressed and released to complete a stroke. Any press failure, either mechanical or electrical, must fail safe.

The press can be locked in any desired setting—continuous, single, inch, or foot control—by authorized personnel. Removal of the key prevents the operator from making changes which might endanger him or the machine. To protect the die, a safety stop switch in the control panel enables any type of mechanical or electrical detectors to stop the ram immediately if imperfect feeding or stamping is detected. The press is for trimming, forming, drawing, embossing, coining, staking, and assembly. *Kenco Mfg. Co.*

Circle 51 on postcard for more data

Cleaning Equipment

LARGE capacity equipment for flushing and cleaning out paint passages and hose lines in complex finishing equipment like automatic spray machines, paint heaters and multi-station systems is available from *The DeVilbiss Co.*

The units are available in 2, 5, 10 and 15 gal sizes and will clean hose, heater coils and flush spray guns in a single operation with a minimum amount of solvent. The cleaners consist of a pressure feed tank shell, lid assembly, safety valve, and a triple action cleaner and mixer assembly.

The mixer assembly has two metering valves, one for air and one for cleaning solution.

Circle 52 on postcard for more data

Thickness Tester

WEIGHING less than five pounds, the Model 6 Audigage is used for nondestructive thickness measurement of metals, glass, ceramics, and plastics from one side.

When a high-sensitivity ceramic transducer is applied to one surface of the material under test, the instrument indicates harmonic resonances by an audible signal in the headphones and by deflection of a small indicator. Simultaneous computation and conversion of these resonance frequencies to thickness is registered on a panel meter.

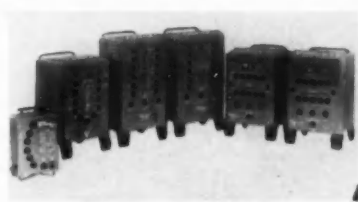
The unit may be used on any flat, cylindrical, or compound-curved surface, down to a one inch radius, using the standard transducer provided. Different transducer mountings are available for measuring smaller pipe or tubing, and for measuring thickness from concave surfaces. *Branson Instruments, Inc.*

Circle 53 on postcard for more data

Electric Arc Welders

EIGHT different models of electric arc welders are being offered by *Forney Arc Welders, Inc.* Including a heavy-duty 350 amp limited input industrial model, the complete line of a-c transformer arc welders and accessories fills industrial needs for general purpose welding.

Sizes range from the 5 to 80 amp F-100 welder with six heat stages to the 5 to 350 amp Model I heavy ser-



Forney electric arc welders

vice unit with 36 heat stages. The cases are of special design and construction eliminating the undesirable effects of eddy currents. Forney welders are thoroughly waterproofed and insulated for outdoor or indoor service. They accommodate rod sizes from 1/16 to 1/4 in. diameter in types designed for a-c welding of cast iron, mild steel, high carbon steel, stainless alloy, aluminum, and other metals.

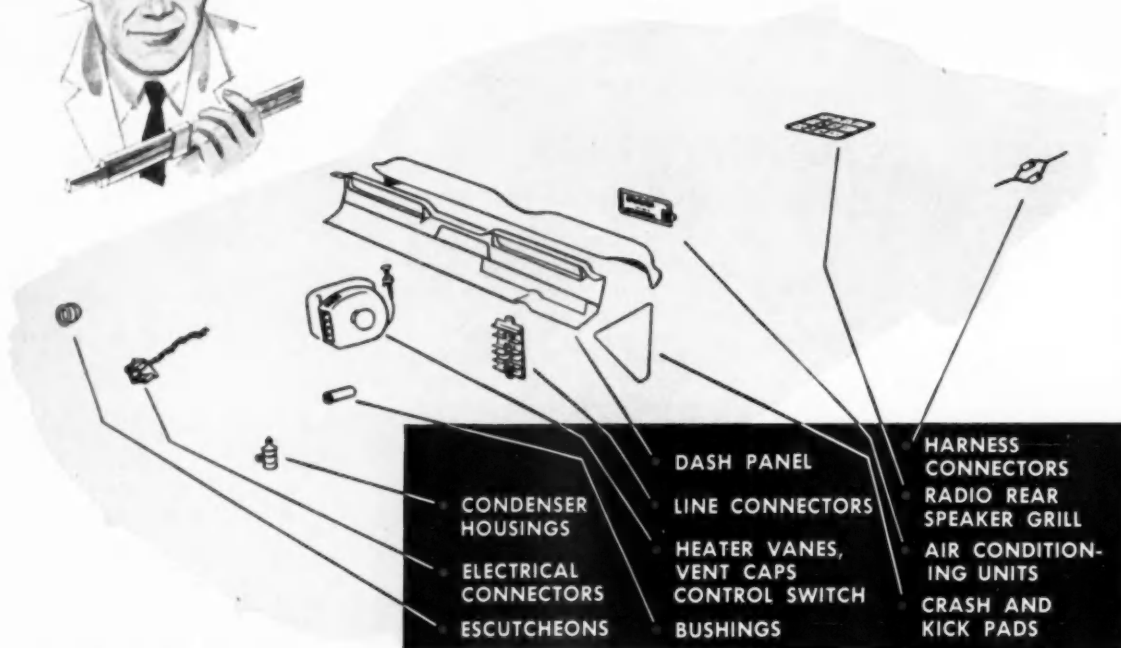
Circle 54 on postcard for more data
(Turn to page 77, please)

CYCOLAC

THE TOUGH, HARD **ABS** PLASTIC
from BORG-WARNER



SERVES THE AUTOMOTIVE INDUSTRY
with economical, long-lasting parts and assemblies!



BETTER IN MORE WAYS THAN ANY OTHER PLASTIC!

Only Cyclocac combines so many advantages in one versatile material! It's rigid—it's tough—it gives you high impact resistance, even at temperature extremes. Cyclocac meets your demands for rugged duty *without* requiring increased sections. It brings you every design and economic advantage of plastic molding and vacuum forming. Get extra quality and extra performance per dollar with Cyclocac.

*the New dimension in design . . .
the New element in production!*

only CYCOLAC has all these advantages!

- Superior Impact Strength at Low Temperatures
- Rigidity — at High Temperatures
- Easily metallized
- Corrosion, Stain Resistant
- Tough, Hard Surface
- Wide Range of Colors
- Can Be Painted
- Good Electrical Properties
- Dimensional Stability

WRITE FOR COMPLETE INFORMATION TODAY!

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Marbon
CHEMICAL

SYNTHETIC RESINS

Division of BORG-WARNER • Washington, W. Va.

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WEST COAST: Harwick Standard Chemical Co., Los Angeles, Cal.

CANADA: Dillons Chemical Co. Ltd., Montreal & Toronto

EXPORT: British Anchor Chemical Corp., New York



Tapping Machine

NINETY-THREE holes in two sides and rear of a tractor transmission case are tapped during each operating cycle of the Model HHU85, three-way, horizontal machine.

The parts to be tapped are held by a simple, manual clamping arrangement on the surface of the hydraulic actuated work table. After a transmission case is loaded and clamped, the table is moved to the rear against a positive stop which brings the case into position for tapping. After all the 96 holes are tapped, and the taps are withdrawn from the workpiece, the table is brought forward by hydraulic power to the unloading position.

The spindles in each of the spindle units are equipped with individual lead screw feed and each spindle is driven through universal joints and telescoping drive shaft. *Moline Tool Co.*

Circle 55 on postcard for more data

Blade Facing Head

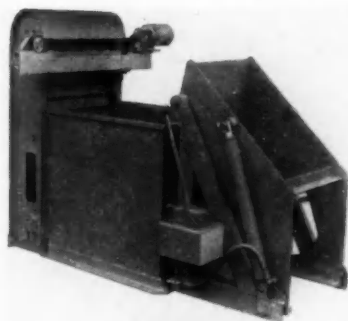
An adjustable blade facing head for precision plunge facing of wide surfaces is said to eliminate the need for special tooling to bore, face, or spot face wide surfaces.

The tool, named Microface, employs a solid one-piece head and is available in a range of sizes to machine diameters from 1½ to 8½ in. sizes. *DeVlieg Machine Co.*

Circle 56 on postcard for more data

High-Speed Feeder

CLARK high-speed hopper feeders, through the combination of a continuous operating vane-type elevator aligning and conveying cylindrical



Clark high-speed hopper feeder

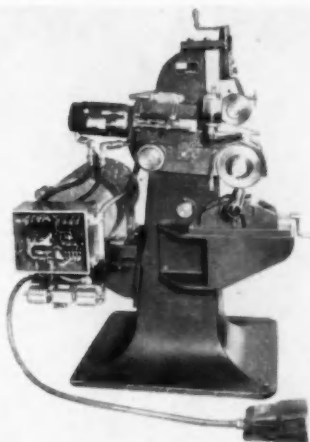
stock from the hopper and a powered out-feed mechanism, can feed up to 7000 average length cylindrical pieces per hour. The adjustable feed speed,

with safety slip clutch, eliminates possibility of over-feeding of parts to centerless grinders, automatic lathes, dial feed presses, forming machines, assembly devices, billet heaters, etc.

The out-feed mechanism is capable of conveying parts up to 20 ft from the feeder escapement to the operating machine. No adjustment is necessary to accommodate all length and diameter parts in the feeder's range. *Clark Industries.*

Circle 57 on postcard for more data

Pipe, Tube Cut-Off Units



Pictured is a Continental rotary pipe and tube cut-off machine designed for use with the smallest and lightest gage tubes to heavy-walled pipes in diameters up to 12¾ in. OD. The hydraulic power check achieves a smooth cutting stroke by keeping regulated cutting pressure on the wheel and work. (*Continental Machine Co.*)

Circle 58 on postcard for more data

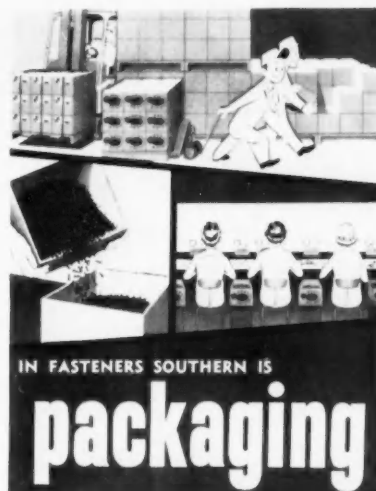
Multi-Purpose Fixture

A MULTI-PURPOSE sharpening fixture that offers a means of sharpening single and multiple-flute gun drills, gun-type reamers and conventional reamers is available from *Star Cutter Co.*

Mounted on a conventional tool grinder, the fixture enables an operator to accurately position the tool for sharpening of compound-angle surfaces. This is accomplished by swinging the fixture to a vernier angle setting and positioning a flute stop by means of a vernier-located setup gage.

Circle 59 on postcard for more data

**AUTOMOTIVE INDUSTRIES
KEEPS YOU INFORMED**



IN FASTENERS SOUTHERN IS

packaging

You asked for it, and Southern Screw produced it—a completely redesigned packing system to save you time and money straight across the board, from Receiving to Production line. Southern Screws are shipped to you in units of 36 cartons, steel strapped to a free 2-way entry 30" x 30" pallet. The 9" x 9" x 6½" carton is 275# test board. Telescopic top, with industrial adaptation of Southern's famous "EZ to C" label on top and side, provides extra bulk fastener container for use at different production line stations. Whether you store and handle components manually or mechanically, see how Southern's new bulk packaging means dollars to you in time and production savings. Immediate shipment from Southern's 1,500,000,000-piece stock.

Write for Southern's new stock list and bulk packing chart BP-2. P. O. Box 1360, Statesville, N. C.

**Tapping Screws • Wood Screws
Machine Screws & Nuts • Stove
Bolts • Carriage Bolts • Dowel Screws
Hanger Bolts • Drive Screws**

Manufacturing and Main Stock
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Circle 138 on Inquiry Card, for more data

NEW

PRODUCTS

AUTOMOTIVE-AVIATION

FOR ADDITIONAL INFORMATION, please use reply card at back of issue

Three-Phase Transformers

A line of general purpose three-phase transformers using thermosetting resin embedment has been de-

signed in 9 and 15 kva ratings. They can be used in applications to serve lighting loads from power circuits or to step down voltages for electrical

appliances, portable tools, pumps, compressors, or machine tools.

The embedment material is epoxy resin with electrical grade silica as filler. *Westinghouse Electric Corp.*

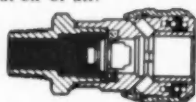
Circle 80 on postcard for more data



Wherever you use compressed air... just **PLUG IN THE POWER** with **HANSEN Quick-Connective Couplings**

As easy as plugging in your electric shaver

To connect the Coupling, just push the Plug into the Socket—with one hand. Flow is instantaneous. To disconnect, push back sleeve on Socket. Coupling disconnects with instant, automatic shut-off of air.



Blue section shows how Socket, when disconnected, automatically shuts off air by leak-proof seal of metal valve against rubber valve seat.

Quick Connection and Disconnection

Instant Automatic Flow or Shut-Off

Write for Hansen Catalog

—a ready reference when you want information on couplings in a hurry. Lists complete range of sizes of Hansen One-Way Shut-Off, Two-Way Shut-Off, and Straight-Through Couplings.



Quick-Connective Fluid Line Couplings for

AIR • OIL • GREASE • HYDRAULIC FLUIDS • WATER • VACUUM • STEAM OXYGEN • ACETYLENE • REFRIGERANTS GASOLINE • COOLANTS • LP-GAS

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MANUFACTURING COMPANY

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Machinable Ceramics

Duramic Grade HT-2-M is a high temperature heat shock resistant ceramic suitable to 2200 F which can be readily machined with no further firing required.

HT-2-M ceramic rods and disks are available in diameters from 9/16 to 2 1/4 in. and in lengths to 1 in. HT-2-M has a low thermal expansion rate which permits the material to withstand rapid temperature changes without cracking or spalling. It can be machined on conventional machine shop equipment using carbide tipped tools. *Duramic Products, Inc.*

Circle 81 on postcard for more data

Hydraulic Power Units

The Dynex line of power units offers a choice of 10 standard reservoirs ranging from 10 to 100 gallon capacity. The units are designed to meet JIC specifications.

A wide variety of pump and electric motor combinations can be mounted on these units to provide a source for dependable, low cost hydraulic power. If close motor/pump connection is required, electric motors with a special flange for the mounting pump can be supplied. *Dynex, Inc.*

Circle 82 on postcard for more data

Radial Bearings

Deep groove radial bearings for applications up to 900 F are available in three R-series sizes from *Industrial Tectonics, Inc.*

Material for balls, races and retainers is high speed tool steel. The retainers are machined, and of snap-in type construction.

Circle 83 on postcard for more data

(Turn to page 80, please)

ROLLED SPLIT SPACER TUBES

Save money, time, materials! Substitute these economical spacer tubes for costly parts machined from pipe or tube. Made of steel, aluminum or stainless to your exact dimensions. Furnished plain or plated.



PRECISION THRUST WASHERS

Solid bronze, or steel with bronze on one or both faces. Cold-rolled for extra hardness. Flat, spherical or special shapes. Grooves, holes, nibs, lugs, scallops.

SLEEVE BEARINGS

Tin- or lead-base babbitt, copper alloys, aluminum alloy. These alloys, applied to steel backs, meet 95% of today's engine bearing requirements.



PLAIN and BIMETAL BUSHINGS

Plain: Solid bronze, steel or aluminum. *Bimetal:* Steel lined with bronze, babbitt, copper or aluminum alloy. With oil holes, grooves, slots, notches as required in your application. Straight, lock or special seams.

Consult our Engineering Department for design information, or send for literature.



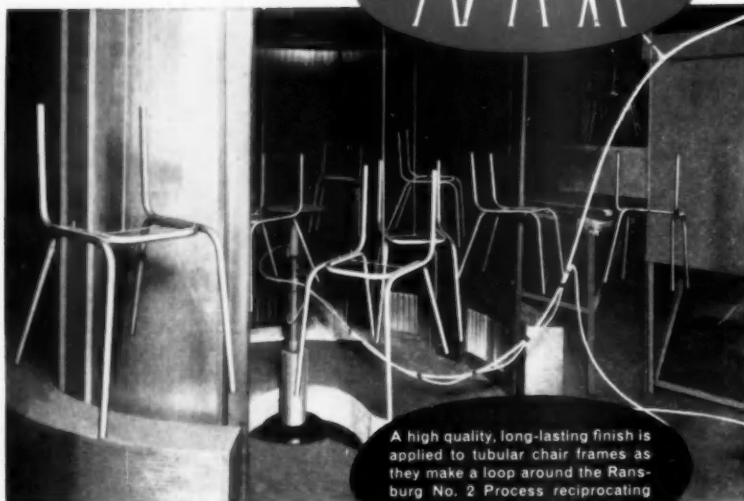
FEDERAL-MOGUL DIVISION

FEDERAL-MOGUL-BOWER BEARINGS, INC., 11037 SHOEMAKER, DETROIT 13, MICHIGAN

RESEARCH • DESIGN • METALLURGY • PRECISION MANUFACTURING

RANSBURG**Electro-Spray...**

**PROVIDES 50% PAINT SAVING
(over the former dip method)
in the finishing of KAY-MAR
DINETTE FURNITURE**



A high quality, long-lasting finish is applied to tubular chair frames as they make a loop around the Ransburg No. 2 Process reciprocating disk in the finishing department at Kay-Mar Industries.

● Kay-Mar Industries, Cassopolis, Michigan, switched from the dip method to Ransburg Electrostatic Spray Painting because they wanted to improve the quality of the finish on their metal furniture line.

Now, with electrostatic spray painting, they get a heavier, more uniform application, which was not possible with former dip. With electrostatic, they are able to use metallic coatings with higher metal content. In their magazine advertising to the mobile home industry, they proudly say: "Finest finish in the industry at no additional cost to you!"

Electrostatic provides other advantages at Kay-Mar. They picked up some additional—and much needed—floor space when dip tanks were removed. Their insurance rates were reduced because of improved "housekeeping" conditions. Frequent color changes are made quickly and simply, and rejects—which used to run 1 1/2%—are reduced to less than a quarter of one per cent.

NO REASON WHY YOU CAN'T DO IT, TOO!

Let us test prove the advantages of automatic electrostatic spray painting on your products in our complete laboratories. No obligation. Call or write for our No. 2 Process brochure, which shows a variety of automatic painting installations on a wide variety of products. Or, if your production doesn't justify automatic painting, let us tell you about the new Ransburg No. 2 Process electrostatic hand gun, now widely used by both large and small manufacturers.

**RANSBURG**

**RANSBURG
Electro-Coating Corp.**

Box-23122, Indianapolis 23, Indiana

Variable Delivery Pump

A variable delivery pump has been made available for industrial applications and includes an integral pressure compensator which controls the pump volume at preselected adjustable pressures.

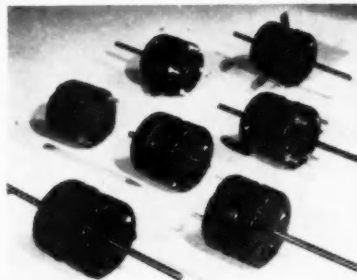
Designed for pressures up to 1000 psi, the pump limits its delivery to system demand. Maximum delivery can be limited by means of a mechanical adjustment. Pressure compensation can be varied from 200 to 1000 psi. Available for flange, foot or gasket mounting. *Vickers, Inc.*

Circle 84 on postcard for more data

New Small Motor

A unitized motor, available first in 4-pole, KSM 59-frame, shaded-pole and permanent-split capacitor ratings up through 1/15 hp, is designed for use in such air moving and small machine applications as ventilators, heaters and in many other types of small motor-driven equipment.

Relative to conventional motor design, the new design offers either



higher output for the same size, input, and temperature rise; or lower current input for the same size, output, and temperature rise; or lower temperature for the same size, input, and output. *General Electric Co.*

Circle 85 on postcard for more data

**Demand Pressure
Regulator**

Specifically designed for and flight tested in an automatic flight control system on a century series aircraft, the Lear demand pressure regulator furnishes a constant demand pressure at flows up to 1 gpm.

Demand pressure is not affected by changes in line pressure and is regulated by means of a screw adjustment from 500 to 3000 psi. The unit is damped internally to prevent oscillation due to sudden flow changes. *Lear Grand Rapids Div.*

Circle 86 on postcard for more data



Geared by FULLER . . .

YELLOW TRANSIT buys more Fuller-equipped KW's

Yellow Transit Freight Lines, Inc., Kansas City, Missouri, recently purchased an additional 40 diesel-powered Kenworth CBE Tractors and now operates 342 Kenworths of the same type, all equipped with Fuller 5-A-65 Heavy-Duty 5-speed Transmissions.

Superintendent of Maintenance Mel McClure says, "We specify Fuller for a number of reasons. The 5-A-65 Transmissions in our Kenworths have

given us the best of service. Maintenance costs have been low; parts and service availability along our routes is excellent. Long life, correct gear splits and freedom from downtime really appeal to our drivers and mechanics. For dependability and ease of operation . . . and to help us move more goods, more efficiently . . . Fuller Transmissions are the best."

One of the fastest-growing motor freight carriers in the country, Yel-

low Transit has more than doubled tonnage and gross revenue since 1955. The Fuller-geared fleet now operates over 17,000 route-miles throughout nine states in the Midwest and Southwest.

For lower operating costs, less downtime for maintenance, reduced driver fatigue and *greater profits*, ask your truck or equipment dealer about the Fuller Transmission best suited for *your* operation.

FULLER

TRANSMISSION DIVISION
MANUFACTURING COMPANY
KALAMAZOO, MICHIGAN



Subsidiary EATON Manufacturing Company

Unit Drop Forge Div., Milwaukee 1, Wis. • Shuler Axle Co., Louisville, Ky. (Subsidiary) • Sales & Service, All Products, West. Dist. Branch, Oakland 6, Cal. and Southwest Dist. Office, Tulsa 3, Okla.
Automotive Products Company, Ltd., Brock House, Langham Street, London W.1, England, European Representative

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O-RINGS

Go Goshen

Capitalize on Goshen's experience in serving the needs of hundreds of large and small users of o-rings in the United States and Canada. Precise control of quality thru every stage of formulation and manufacture is the key to an outstanding record of sealing success.

GRC o-rings in all standard AN, MS, SAE and JIC sizes, in many non-standard sizes and in special sizes, are available from established and proven synthetic and silicone specification compounds. Go Goshen for efficient sealing under most any given conditions.



Ask for your free copy of 16-page O-ring Brochure on size, groove dimensions, compounds and other helpful information.

Goshen Rubber Co., Inc.

2749 S. TENTH STREET

GOSHEN, INDIANA



ON OUR
WASHINGTON WIRE

Businessmen who delay returning forms for the 1958 census of business are getting a friendly reminder from the Government—the law requires that they be filled in completely, accurately, and returned promptly.

But lurking behind the gentle persuasion is the threat that firms who fail to file the forms, do not fill them out completely, or wilfully make errors can be subject to stiff fines and even jail sentences. More than a million firms already have filed the census forms.

Project Argus (upper-air atomic blasts) had no apparent effect on anti-missile-missile work. Speculation in some quarters was that the thin layer of atomic particles spread by blasts might hamper detection of enemy missiles. Best-informed Army opinion is that the Nike-Zeus system now in the works is neither aided nor hindered by Project Argus.

Business recovery is accelerating. True, some scarce buying of metal is responsible for the extra zip in total sales. But there are undeniable gains in overall factory output and consumer buying. Outlook: Gross national product will hit \$485 billion (now at \$464 billion) by the year's end.

Rocketeers figure with a little tinkering they can recover the initial stages of their missiles. Theory is to get them back down to earth on a cushion of air supplied by auxiliary jet engines. This would cut space probe and satellite launching costs considerably.

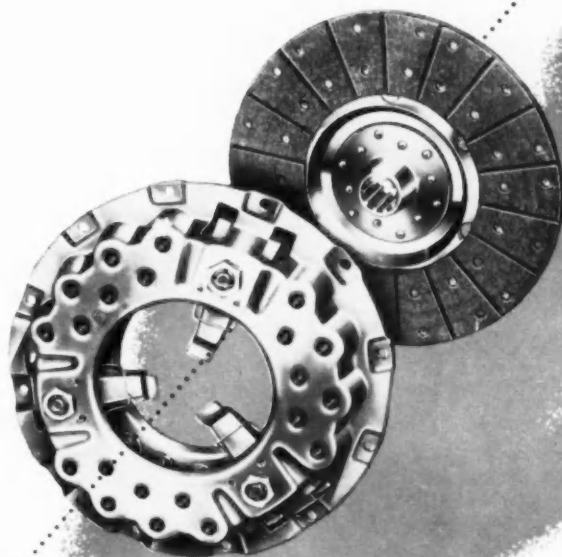
Washington is stepping up its pressure on both labor and management to reach an agreement that won't cause a boost in steel prices. "The public is sitting at the bargaining table" this year and will oppose an inflationary wage settlement, Labor Secretary James P. Mitchell warns.

President Eisenhower earlier also made it clear that steel workers should not demand—nor steel executives agree to—any settlement that would exceed increases in productivity and produce price rises. As yet, no one in Government has indicated whether—or how much—productivity has been increased in the industry.

Russia can be surpassed in space research in three or four years, Pentagon space men believe. They reason this way: U. S. space exploration programs are properly conceived. The remedy for our current secondary position in space activity is to accelerate space research steadily. A flood of spending now won't mean an immediate catch-up with the Russians.

LIPE

**Adapted to changing vehicle
horsepowers, loads and use requirements**



***That's why you get more ton-miles and more
engagements per mile out of a Lipe Heavy-Duty Clutch***

At Lipe-Rollway our automotive division makes heavy-duty clutches...and nothing but heavy-duty clutches. We've been devoting our research, development, technology, equipment and skill to that job for years.

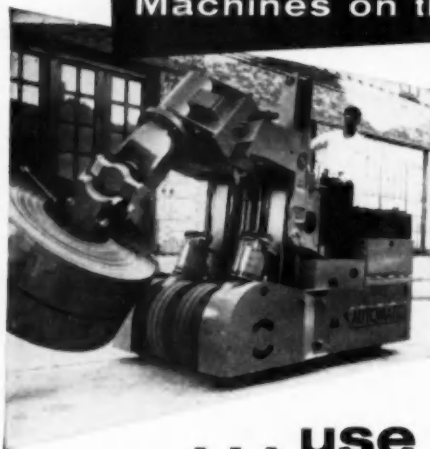
Today, the list of Lipe clutch users reads like a "Who's Who" of the heavy-duty vehicle industry. Tens of thousands of Lipe clutches are in daily service... thousands more are added each year. That is because our constant aim has been to build a more serviceable clutch, continuously adapted to changing vehicle horsepowers, loads and use requirements.

Advanced equipment, flexible deliveries, shorter lead times, a planned program of design development, all make Lipe the clutch best suited to serve you. *Let our engineers work with your men to give you a clutch engineered to your job. Write for information.*



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Machines on the move



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FAIRFIELD GEARS!

POWER to operate these machines and countless others that you may see every day, travels smoothly, efficiently, dependably through FAIRFIELD GEARS. By specializing exclusively in "Fine Gears Made to Order", Fairfield has become one of America's largest independent producers of these parts.

If you use gears in the product you make, we believe it will pay you, as it has others, to become acquainted with FAIRFIELD—the place where fine gears are produced to meet your specifications EFFICIENTLY, ECONOMICALLY! Fairfield's production facilities are unexcelled. Call or Write.

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A "PLUS VALUE" IN ANY PRODUCT



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Made to Order for:

TRACTORS • HEAVY DUTY TRUCKS • AGRICULTURAL MACHINERY • POWER SHOVELS AND CRANES
MINING MACHINES • ROAD GRADERS • BUSES • STREET SWEEPERS • INDUSTRIAL LIFT TRUCKS

SAE National Automobile Week

(Continued from page 39)

major space saving but is a big factor in cost reduction as well.

Reduction of Metal Finishing Costs

What can be done to reduce metal finishing costs? All of the participants agreed that proper material handling—at the press, at assembly, in transit, in storage, and on the shipping dock—is the key to many of the problems in any plant. Sheet metal surfaces must be protected against damage or scratching from the time the raw material is received.

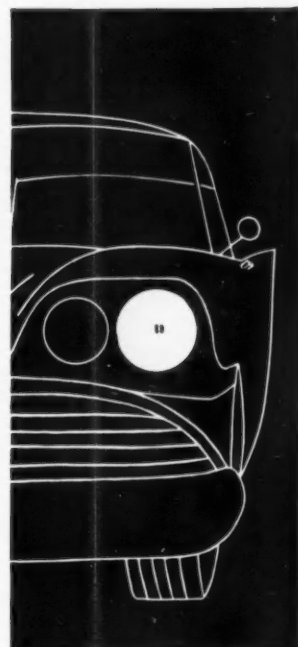
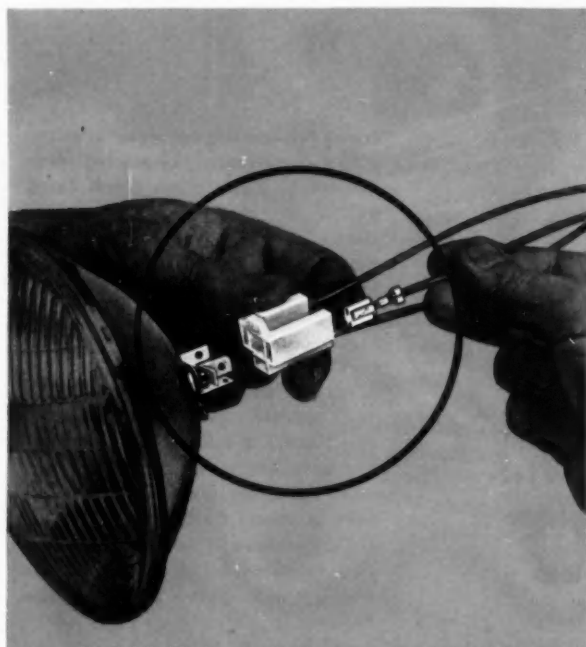
Press dies and their cooperating elements must be so designed as to eliminate the hazard of scratches or clamping marks. And the same applies to automation devices. Automatic loading and unloading of presses goes far to eliminate the troubles associated with manual handling.

One of the headaches in the body shop is the styling treatment that produces relatively flat panel sections at junction points where welding heat can cause distortion. Welding assembly fixtures and bucks must be carefully designed and clamps properly located to prevent marking or misalignment.

Ornamentation has become an important element of styling and attention to details can go far to reduce metal finishing costs. One of the speakers, a large supplier of moldings and other ornamental parts, produces a variety of such parts in chromium plated finish, in stainless steel, and in aluminum. In the case of aluminum, it is necessary to take particular care of die design to assure good surface finish. Another unique problem incident to the growing use of bright aluminum alloys is in the close control of the thickness of the anodized film. They have found that unless the film is held within 0.0002-0.0003 in. the surface will dull in service.

EXECUTIVES READ
AUTOMOTIVE INDUSTRIES

IT'S A SNAP...



THE **AMP** FASTIN-FASTON SAVES TIME AND MONEY ON YOUR SEALED BEAM HEAD LAMP CONNECTIONS

The new A-MP FASTIN-FASTON snaps onto sealed beam head lamps with a thrust of the fingers. For two or three tabs. The FASTIN-FASTON obsoletes all other connectors, ends inspection rejects, saves on installation time and costs while assuring uniform quality.

FASTIN-FASTON housing made of Cycolac for excellent dielectric characteristics.

Tab receptacles self-lock in housing... offer highest electrical values and rugged, vibration resistance. Compression crimp for maximum conductivity.

No auxiliary parts or accessories.

Unvarying performance and lower cost... a snap for the all new A-MP FASTIN-FASTON.

For more information, write today.

AMP INCORPORATED

GENERAL OFFICES: HARRISBURG, PENNSYLVANIA

A-MP products and engineering assistance are available through subsidiaries in: Canada • England • France • Holland • Japan

AUTOMOTIVE INDUSTRIES, April 15, 1959

Circle 146 on Inquiry Card, for more data

85

AIR BRIEFS

By David A. Partridge

National Bids for Low Cost Air Transportation

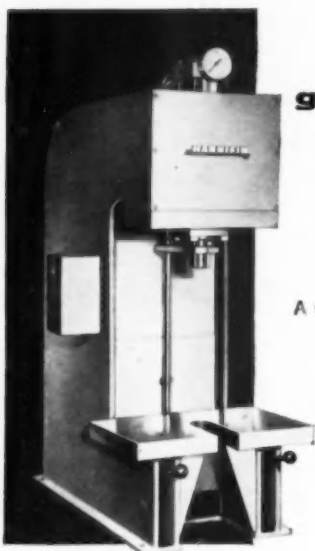
National Airlines, in an effort to attract more Florida-bound vaca-

tioners to airline travel, recently filed application with the Civil Aeronautics Board (CAB) for the lowest fares ever to be asked for

scheduled airline transportation.

The application requested permission to slash night coach fares by 25 per cent, reducing airline travel costs to slightly over three cents per mile. This is less than any other form of mass transportation and places National in a highly competitive position with all forms of surface travel. "At this fare even the man who believes he can operate the family car for seven cents a mile can fly to Florida with his wife and it will cost both of them less money to fly than it would to drive," said Walter Sternberg, National's senior vice president of traffic and sales who announced the new low fare request.

Barring any objections from the CAB the new fares will go into effect April 20th.



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at lower cost with

HANNIFIN "FD" PRESSES

A COMPLETELY NEW LINE OF HIGH-SPEED
HYDRAULIC BENCH PRESSES

FAST DELIVERY—ALL THESE SIZES!
2, 3, 4, 5, 6, 8, 10 and 12 TONS

HEAVY-DUTY OPEN-GAP
PRODUCTION PRESSES

Our quantity production gives you highest quality at lowest cost.

THEY HAVE "EVERYTHING"...

Dual Safety Hand Lever Controls
Dual Electric Push-Button Controls
Adjustable Stroke Control
Reverse on Pressure or Distance
Full Automatic Cycling
Hannifin High Speed Hydraulic Index Tables
Reciprocating Hydraulic Slide Feeds

USE THEM FOR...

Assembly Operations
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Trimming Die Castings
Trimming Plastics
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Preforming — Compacting

MAY BE FLOOR MOUNTED—OPTIONAL, LOW-COST BASES AVAILABLE

Call in your nearby Hannifin man—he's a trained production analyst—to prove how you can do more at lower cost with Hannifin presses. Or, write for our new Bulletin 132A. It tells the whole story.

HANNIFIN COMPANY

543 South Wolf Road • Des Plaines, Illinois

A DIVISION OF PARKER-HANNIFIN CORPORATION

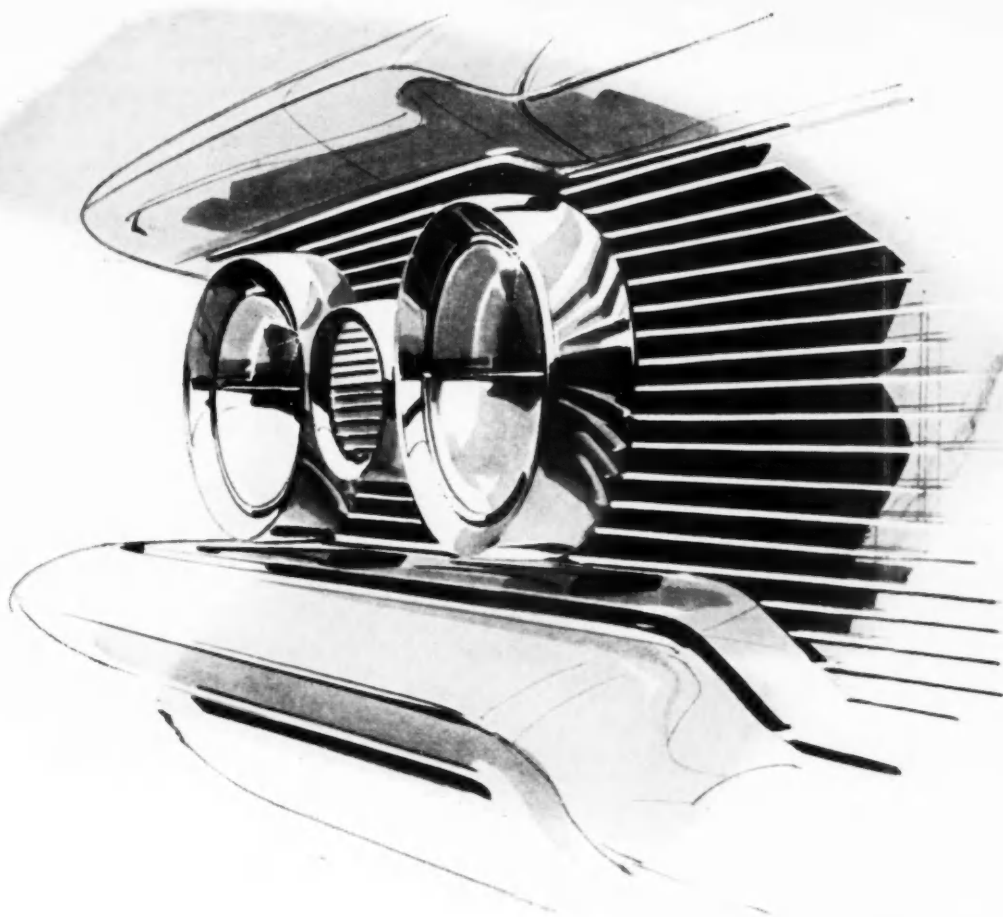
Circle 147 on Inquiry Card, for more data

Urethane Foam in Aircraft Models Increases Range in Wind Tunnel Tests

Urethane foam is being used in aircraft research and development centers to construct wind tunnel test models having greater adaptability, at low cost. For example, designers at Chance Vought Aircraft, Inc. (Dallas, Texas), find that the light-weight urethane permits a wide range in experimentation. By deliberately making them too light initially, models are easily weighted where needed, to study effects of inertial distributions.

Based on diisocyanates, such as the Nacconates produced by Allied Chemical's National Aniline Div., the urethane foam may be made flexible or rigid, light or heavy, by varying formulations. It can be either prepared in slabs or blocks, or foamed directly in place as in the Chance Vought application.

At Chance Vought, the urethane formulation is poured directly into a mold and allowed to foam around a wooden or metal skeleton. This



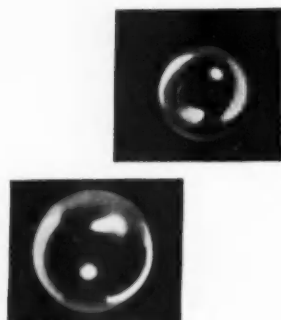
FIRESTONE TURNS ON THE SALES APPEAL WITH *fashionized* ALUMINUM PARTS

Call on the brightest brightwork in the business to put new selling power into your automotive products.

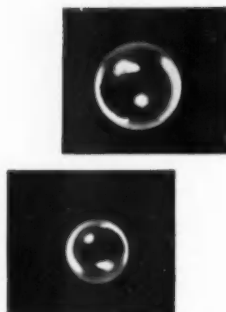
Call on aluminum formed and *Fashionized*[®] by Firestone to catch your customers' eyes. Call on mass-produced bezels and panels and strips up to seven feet long and shaped with custom quality and character. Call on interior trim textured and tinted to your most meticulous specification.

In short, call on *Fashionized* Aluminum and on Firestone's more than 50 years of experience in the fabrication and finishing of metal. Enjoy every advantage—from competitive capacity to competitive cost—of the industry's finest production facilities. Your inquiries and inspections are cordially invited.

FIRESTONE FASHIONIZED ALUMINUM
FIRESTONE STEEL PRODUCTS COMPANY, AKRON 1, OHIO



**WHEN
IT COMES TO
BALL BEARINGS...**



**ALWAYS
COME
TO...**



Here at BCA you'll find a number of things that work to your advantage. Production flexibility—even when everyone wants everything right now. Ability to fulfill unexpected needs for special engineering. A real appreciation of a supplier's obligation to meet "when-promised" delivery dates. Pride of workmanship stemming from 50 years' experience in the design and production of quality ball bearings. All these pay off for BCA customers. They will pay off for you when you come to BCA for your original equipment and replacement ball bearing needs. Bearings Company of America Division, Federal-Mogul-Bower Bearings, Inc., Lancaster, Pa.



"backbone" provides internal reinforcement and rigidity. A fiber glass/epoxy laminate, previously laid up in the mold provides the model with a hard, smooth skin for minimum wind resistance.

Models are used to test wings, bodies and tail sections for flutter and vibration under simulated flight conditions. The models are also employed in design studies of pilot ejection capsules.

Ryan Develops New Explosive Forming Method

Called "high energy forming," a new method of economically forming complex parts of hard-to-form alloys, uses the tremendous power of inexpensive explosives to form parts in a fraction of a second.

In the process, developed by the Ryan Aeronautical Co. (San Diego, California), a metal part is placed in a die and the entire assembly is then lowered into a water filled pit. A charge of explosive is placed within the die and detonated. The resultant explosive pressure forces the water against the part and into the shape of the die. The water then blows out the top like a geyser. With this method the metal is forced into shape at speeds of 200 to 500 fps.

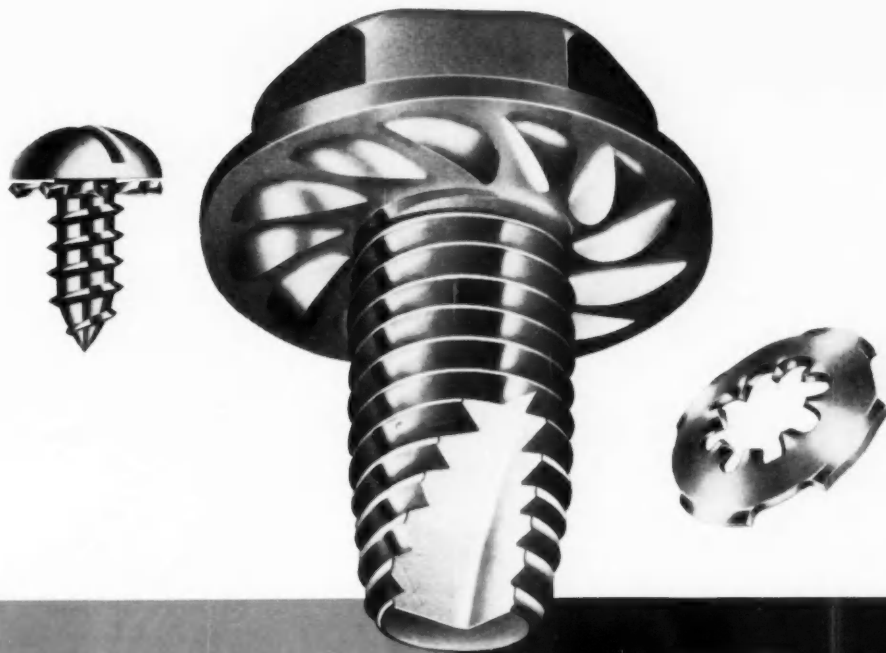
Hemispheres, bell shapes, corrugations, deep draws, embossments and other difficult shapes have been successfully formed in "tempermental" alloys with the new Ryan process. They are formed with almost no spring-back or brittleness.

Ryan engineers are testing stainless steels, Inconel, titanium, brass, copper, aluminum, nickel and cobalt-base super-alloys and many other varieties of metals with success, in explosive forming.

Wages Increase, Employment Average Declines

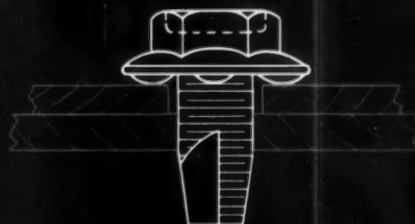
Average hourly earnings in the aircraft, engine, propeller and parts industry amounted to \$2.51 during 1958, an increase of 15 cents per hour over the 1957 average hourly rate, according to the Bureau of Labor Statistics. This represents an increase of more

(Turn to page 94, please)



HOW TO SELECT COST-SAVING

fasteners for sheet metal



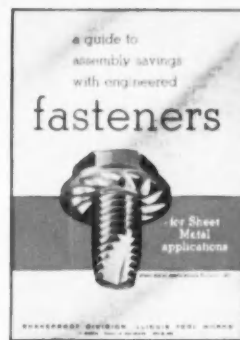
A TYPICAL EXAMPLE: How to Avoid Stripping—

When high stripping torques are required, a Shakeproof NIBSCREW* should be used. "Nibs" under the head take up excessive driver torques and eliminate loose screws, re-work and repair.

You can realize important savings on your assembly line by specifying fasteners that eliminate operations, speed up production and assure highest quality. Engineered Fasteners by Shakeproof now overcome stripping, provide sealing, assure maximum locking and solve countless production problems encountered in mass assembly of products using sheet metal.

SEND FOR NEW SHAKEPROOF BULLETIN NO. 100!

Illustrates twelve typical examples of cost saving fasteners for sheet metal applications. Describes important "check points" for fastener selection. Offers testing samples. Write for your copy today!



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"FASTENING HEADQUARTERS"®

DIVISION OF ILLINOIS TOOL WORKS

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Division of Canada Illinois Tools Limited, 67 Scarsdale Road, Don Mills, Ontario

Trends in the CONSTRUCTION EQUIPMENT INDUSTRY

(Continued from page 55)

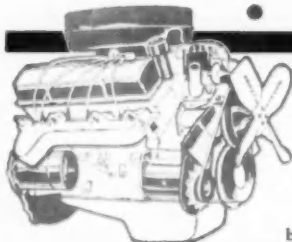
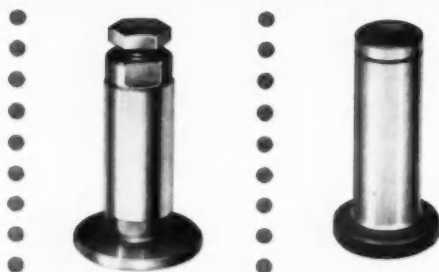
trolled type ejection, apron opening of 5 ft, 4 in., adjustable scraper axles (to level the bowl), and synchronized air-operated brakes.

Top speed of the new earthmover



New Caterpillar No. 619 tractor and No. 442 scraper combination

JOHNSON *tappets*



**for all engine applications*

All of the engineering and manufacturing effort at Johnson Products goes into producing a better tappet. Continual experimentation and exacting quality control make JOHNSON TAPPETS worthy of your consideration. Only proven materials, covering a range of hardenable iron, steel, and chilled iron of various alloys, are used in JOHNSON TAPPETS. These tappets are successfully used in jobs ranging from light duty to the most severe, punishing applications. Serving all industry that employs internal combustion and diesel engines.



"tappets are our business"

JOHNSON *Jp* PRODUCTS

MUSKEGON, inc. MICHIGAN

is 30.2 mph-considered high for a two-wheel hauling unit.

Sales and Earnings of Allis-Chalmers

Allis-Chalmers Mfg. Co. reported sales of \$531,972,829 in 1958 as compared with \$534,146,214 in 1957. Net earnings after preferred stock dividend requirements were \$19,235,127 in 1958, and \$17,353,653 in 1957. The 1958 statement includes for the first time the operating results of Canadian Allis-Chalmers.

Two new four-cylinder engines, the G-149 and G-226, have been announced by Allis-Chalmers. The G-149 is a 149 cu in. gasoline engine, developing 45 bhp at 2000 rpm. It has a compression ratio of 7.5 to 1. The G-226 is a 226 cu in. gasoline model, developing 67 bhp at 1800 rpm. Both are water-cooled, valve-in-head designs, having replaceable wet-type cylinder sleeves. They are also available for use with natural or LP gas, kerosene, No. 1 distillate, or tractor fuel.

New Trademark

LeTourneau-Westinghouse Co., Peoria, Ill., is adopting a new trademark to help in company identification. Instead of the former symbol, consisting of a large "W" in a rectangular box, with a smaller "Le T" superimposed, the new trademark will have a large "LW" in a box with four curved sides, and with the name "LeTourneau-Westinghouse" on the borders.



Roads, Rails and Vapor Trails

Whether it hugs the earth or rides the stratosphere's jet streams, **modern** transportation has one **uncommon** denominator—stainless steel.

America's first **supersonic** bomber—the world's **lightest** full-size, railroad passenger car—the trucking industry's **highest capacity** lightweight trailer—all owe their existence to stainless steel's extraordinary strength-weight ratio and almost indestructible good looks.

Every American auto on the road today uses stainless steel functionally and decoratively to protect painted and treated surfaces, because only stainless steel requires no protective treatment to preserve factory freshness and assure lasting customer satisfaction. **And** its unusual workability means that finished product costs are usually lower than for any other bright metal.

Whether your primary interest is function or form, J&L provides **consistent** quality for uniform production.

J&L leads the industry in melt shop standards for stainless steel—the point where quality starts, **and production economies begin.**



Plants and Service Centers:

Los Angeles • Kenilworth (N. J.) • Youngstown • Louisville (Ohio) • Indianapolis • Detroit



STAINLESS

SHEET • STRIP • BAR • WIRE

Jones & Laughlin Steel Corporation • STAINLESS and STRIP DIVISION • Box 4606, Detroit 34

Westinghouse with six

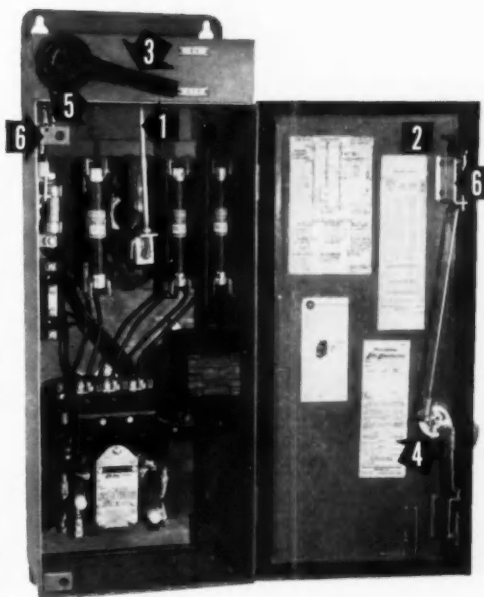


develops new motor starters "monkey proof" safety features

Westinghouse NEMA 12 Life-Line combination starters end unauthorized tampering, offer greater safety and convenience to service personnel

Check these six great new safety "firsts"...

1. The disconnect is permanently attached to handle. On-Off handle is not disengaged by opening the door.
2. Door must be fully closed and sealed before On-Off handle will operate disconnect. (See point 5, below.)
3. Operating mechanism can be padlocked to prevent operation.
4. Door opens simply, easily with tool (screwdriver). Cannot be opened with bare hands alone.
5. If desired, On-Off handle and disconnect can be operated with door opened. To operate, simply depress safety release.
6. Interlock assembly will not allow door to be opened while handle is in ON position. Removing spring from assembly will permit this if desired.



J-30273

... plus these extra important features, at no extra cost!

- NEMA 12 dustproof enclosure meets all JIC and other heavy industry specifications.
- Molded nylon handle for increased impact strength.
- Provision for padlocking door and handle.
- Tilted top to drain liquids away from door seal.
- Adjustable tie-rod between handle and disconnect to allow either switch or circuit breaker.
- Available in four standard sizes, from 1 through 4.
- Adequate internal wiring space.
- Extra space for third and fourth overload relays and excess capacity transformer.
- Auxiliary contacts can be field mounted in Visi-Flex* disconnect switch.
- All parts and complete panel removable from front.
- Components available for custom panel construction.

*Call your local Westinghouse representative or distributor now, or write
Westinghouse Electric Corporation, Standard Control Division, Beaver, Pa.*

*Trade-Mark

YOU CAN BE SURE...IF IT'S **Westinghouse**

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS"
Circle 152 on Inquiry Card, for more data

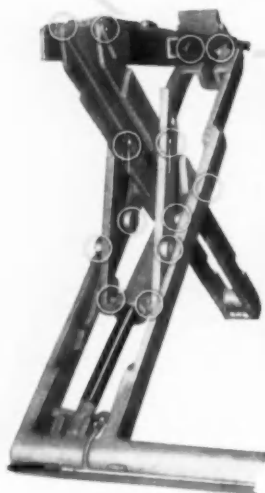
CBS TV MONDAYS

New Glacier DU Bearings



"... less than 1/6th the coefficient of friction we had previously achieved at 15,000 psi."

J. E. CLARKE, President
Autoquip Corporation



DU Bearings are installed at vital bearing locations on the lift made by Autoquip Corp. DU eliminates need for grease fittings, grease grooves, grease guns—and maintenance. Other suggested applications of DU in the auto industry: windshield wipers, steering columns, suspension systems, control rods.

In search of a "permanent" or "dry" bearing for their Porta-Contact hydraulic lift, Autoquip engineers tested new Glacier DU bearing material. To their amazement, DU bearings had less than 1/6th the coefficient of friction of the best material previously tested. Under endurance runs, DU gave equal to three years' service without so much as a squeak. Now, after nearly one year of actual lift operation, not a single bearing problem has arisen!

DU is a patented composite material consisting of a steel-porous-bronze interlayer impregnated with a lead-filled TFE[®] fluorocarbon resin. It has greatest structural strength, heat conductivity, and thermal stability of any dry bearing ... withstands temperatures from -328° F to +536° F.

Exhaustive testing of DU has permitted the establishment of curves relating bearing life to various load-speed combinations. Designers can quickly predict DU bearing life by referring to these curves—and other design data—found in Bulletin DU-458. Ask your bearing manufacturer about it, or write to SPECIAL PRODUCTS DEPT., United States Gasket Co., Camden 1, N. J.

**United
States
Gasket**

*Teflon, DuPont Trademark
Fluon, I.C.I. Trademark

Plastic Division of
GARLOCK



(Continued from page 88)

than \$1 an hour over the average hourly rate of \$1.48 in 1948.

Employment in the aircraft and missile industry averaged 757,600 workers during 1958, a decline of 4200 workers from the 1957 average, the Bureau of Labor Statistics states.

Lowest point of employment was recorded in May with 467,700 workers listed. Peak employment month during 1958 was November with a total of 767,300 workers. ■

THE BUSINESS PULSE

(Continued from page 60)

outlays), it seems very possible that there may be a good deal more strength in plant and equipment spending in the second half of this year than is indicated by the survey data.

On the assumption that investment outlays do continue upward in the second half of the year and that inventory accumulation of the normal types accelerates, it is not difficult to imagine GNP rising to an annual rate of \$480 billion or more by the final quarter of the year. Increased emphasis on inventory accumulation seems distinctly possible, since last year's substantial liquidation has produced relatively low inventory-to-sales ratios in many areas of the economy. A \$480 billion rate for GNP in the final quarter was the forecast most commonly made as 1959 began.

The third-quarter rise may be relatively moderate since the artificial stimulant now affecting steel operations will be absent. A fourth-quarter rise could be brisk, however, and it could indeed be extremely robust if there should be a conjunction at that time (which seems very possible) of rising investment outlays, a rebound from a steel strike, and the introduction of small economy cars by Chrysler, Ford, and General Motors. If a figure of \$480 billion plus is attained in the fourth quarter, the magnitude of the unemployment problem should be substantially lessened. The unemployment total could, in fact, approach something like "normal" proportions by the year's end. ■

Questions and Answers about ELCIDE 75

*Here's what you'll want to know about this
new bacterial inhibitor for soluble oil emulsions:*

Q: What is Elcide 75?

A: Elcide 75 is a new bacterial inhibitor for standard duty soluble oil emulsions. Chemically, it is a combination of Sodium Ethylmercuri Thio-salicylate (Thimerosal) and Sodium *o*-phenyl-phenate in a concentrated solution.

Q: What does Elcide 75 do?

A: Elcide 75 controls bacteria that contaminate soluble oil emulsions. Since both chemical ingredients are anti-bacterial agents, Elcide 75's double action controls a far wider range of bacteria than the commonly used germicides.



Bacteria like these prematurely spoil emulsions. Elcide 75 stops their damage.

Q: Why is bacteria control important?

A: Bacteria enter emulsions through the air, water, and plant debris. They multiply rapidly and cause odor, corrosion, and premature emulsion breakdown. This compounded damage costs millions of dollars each year in higher maintenance and production costs. Bacteria control reduces these expenses.

Q: How does Elcide 75 lower operating costs?

A: The use of Elcide 75 can increase emulsion life as much as 5½ times. You use less soluble oil. Fewer man-hours are spent servicing machines and disposing of waste oil. And, because machines run longer between emulsion changes, production is increased proportionately.

Q: What is the exact dollar return from Elcide 75?

A: No exact figure can be established because conditions vary between plants. The type of metal, machines, and operations involved, the coolant, and general plant housekeeping are all factors that help determine savings due to Elcide 75. The best way to measure its value is to try Elcide 75 and compare the results with untreated machines under your plant conditions.

Q: How is Elcide 75 used?

A: One ounce of Elcide 75 is added to each four gallons of emulsion. You know you have a safe, effective treatment because you control the dosage.

Q: Is Elcide 75 safe to employees?

A: Yes. It also eliminates objectionable odors and certain bacteria that may cause skin infections.

Q: Will Elcide 75 harm machinery or products?

A: No. In fact, Elcide 75 controls bacteria that often cause acidic corrosion and shortened tool life.

Q: Is more information available on Elcide 75?

A: Yes. Complete data on compatibility, disposal, stability, safety, and other pertinent factors are available on written request.

Q: Where can I buy Elcide 75?

A: Elcide 75 is sold only through selected distributors. To place your order, or for the name of your nearest distributor, write Eli Lilly and Company, Agricultural and Industrial Products Division, Indianapolis 6, Indiana; or telephone ME6-2211.



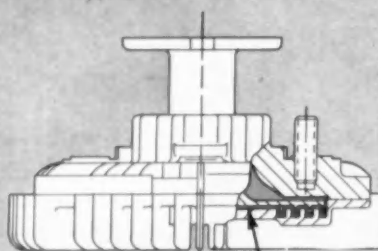
ELCIDE 75TM
PATENT PENDING

KEEPS COOLANTS FRESH AS A DAISY!

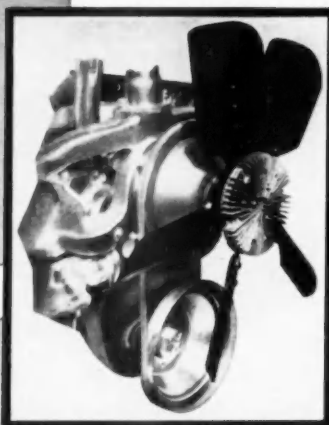
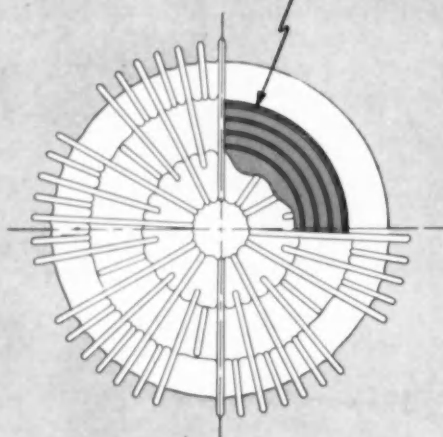
(Lilly's brand of bacterial inhibitor for cutting fluids)

Package	Price per Gal.
1-gal. (4 per case), polyethylene.....	\$8.50
5-gallon, polyethylene.....	\$8.00
55-gallon, stainless steel.....	\$6.50

ELI Lilly AND COMPANY • AGRICULTURAL AND INDUSTRIAL PRODUCTS DIVISION • INDIANAPOLIS 6, INDIANA



SILICONE
FLUID



**FAN DRIVE IMPROVES COOLING,
CUTS FAN NOISE, INCREASES
USEABLE HORSEPOWER**

Designed to use Dow Corning silicone fluid for maximum efficiency and reliable performance, the Eaton Viscous Fan Drive makes it possible to increase cooling capacity at low speeds, or at idle, through the use of larger fans or higher fan-to-engine speed ratios. Engineered to limit speed of fan in the range of 30% to 60% of top engine speed, the Fan Drive reduces noise at cruising speeds and cuts demand on the power plant, thus making more horsepower available for other needs. The Eaton Viscous Fan Drive is one of a number of automotive accessories made by Eaton Manufacturing Company.

How to design for greater reliability with SILICONE FLUIDS

Where reliable, uniform performance over long periods of time and under widely differing conditions is required, Dow Corning silicone fluids excel. Dow Corning fluids are exceptionally resistant to oxidation — do not evaporate, thicken or thin out. They retain near-constant viscosities and show little change with varying temperature. Resistance to breakdown under shear is exceptional . . . these fluids are noted for their uniform damping, hydraulic, and torque transmission properties. As a result, they are specified more and more for long-term, reliable and uniform performance. For further information on properties and typical applications, send for the new *Engineering Guide to Silicone Fluids*, or talk with the technical representatives in our nearest branch office.

FREE!

Engineering Guide to Silicone Fluids

Please send me "Engineering Guide to Silicone Fluids"

Name _____

Company _____

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**Dow Corning
CORPORATION**

MIDLAND, MICHIGAN

ATLANTA • BOSTON • CHICAGO • CLEVELAND • DALLAS
LOS ANGELES • NEW YORK • WASHINGTON, D. C.

More Government Contract Awards

LATEST contracts awarded by various Government agencies, and covering primarily automotive and aviation products, are listed in the following. Typical of the items contained in these monthly listings are: passenger cars, motor trucks, aircraft, military tanks, engines, transmissions, other components, spare parts, plant equipment, etc. This list is for the period March 21 to March 31, inclusive.

ARMBRUSTER & CO., INC., Fort Smith, Ark.

Trucks, 2 ea—\$12,303

BAKER INDUSTRIAL TRUCKS DIV., OTIS ELEVATOR CO., Cleveland, Ohio

Truck, side-loading, 2 ea—\$33,134

BARCO MANUFACTURING CO., Barrington, Ill.

Spare parts, various aircraft—\$164,368

BEECH AIRCRAFT CORP., Wichita, Kans.

Spare parts, various aircraft—\$32,926

BUDD CO., Detroit, Mich.

Wheel, automotive w/ring assy, 965 ea—\$30,252

CHRYSLER MOTORS CORP., Washington, D. C.

Trucks, 58 ea—\$156,444

CLARK EQUIPMENT CO., PIPESTONE PLANT, Benton Harbor, Mich.

Loader, scoop type, 156 ea—\$2,199,600

CLARK EQUIPMENT CO., Buchanan, Mich.

Tractors, wheeled, warehouse, 512 ea—\$1,240,020

CONTINENTAL AVIATION & ENGINEERING CORP., Detroit, Mich.

Engines—\$1,500,000

CONTINENTAL MOTORS CORP., Muskegon, Mich.

Engine, 6 cylinder, gasoline, 63 ea—\$321,477

COOPER TIRE & RUBBER CO., Findlay, Ohio

Tire, 4-100 ea—\$43,214

CRANE CARRIER CORP., Tulsa, Okla.

Trailer, basic utility, 725 ea—\$782,275

CUMMINS DIESEL ENGINE CO., Columbus, Ind.

Engine, Diesel, 10 ea—\$54,680

CURTISS-WRIGHT CORP., Caldwell, N.J.

Spare parts, propellers—\$59,385

DAYTON RUBBER CO., Dayton, Ohio

Tire, 3,200 ea—\$34,720

DIAMOND MOTOR TRUCK CO., Washington, D. C.

Trucks, 1 ea—\$12,750

EL PASO WELDING SUPPLY, El Paso, Tex.

Crawler tractor with angle dozer—\$12,080

FORD MOTOR CO., FORD DIV., Washington, D. C.

Trucks, 4 ea—\$14,194

FOUR WHEEL AUTO CO., Clintonville, Wis.

Trucks, 2 ea—\$47,481

FORD WHEEL DRIVE CORP., Clintonville, Wis.

Truck, 1 ea—\$13,560

GARWOOD INDUSTRIES, INC., Wayne, Mich.

Automotive spare parts, replenishment—\$41,928

GENERAL MOTORS CORP., AC SPARK PLUG DIV., Flint, Mich.

Spark plugs, 28,700 ea—\$42,763

GENERAL MOTORS CORP., CHEV. MOTOR DIV., Detroit, Mich.

Trucks, 234 ea—\$519,864

GENERAL MOTORS CORP., CLEVELAND DIESEL ENGINE DIV., Cleveland, Ohio

Repair parts, Diesel engines, 50,744 ea—\$635,258

GENERAL MOTORS CORP., TRUCK & COACH DIV., Detroit, Mich.

Automotive spare parts, replenishment—\$27,231

GENERAL MOTORS CORP., TRUCK & COACH DIV., Pontiac, Mich.

Automotive spare parts, replenishment—\$27,231

GENERAL MOTORS CORP., TRUCK & COACH DIV., Pontiac, Mich.

Bus, 1 ea—\$11,618

GENERAL MOTORS CORP., TRUCK & COACH DIV., Pontiac, Mich.

Trucks, 3 ea—\$35,150

GENERAL MOTORS CORP., UNITED MOTORS SERVICE DIV., Detroit, Mich.

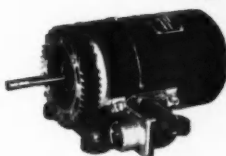
Automotive spare parts, replenishment—\$25,432

GENERAL SAFETY EQUIPMENT CORP., North Branch, Minn.

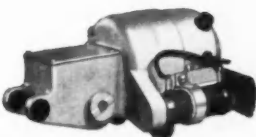
Truck, firefighting, 30 ea—\$358,370

(Turn to page 100, please)

you get the
RIGHT MOTOR...



Totally enclosed fan-cooled 27 volt DC motor for dry air pump drive. Frame 3 1/4 x 1 1/2



Gearmotor with one spur gear and one worm gear stage giving right angle drive for business machines. Frame 3 3/8 x 1 3/8

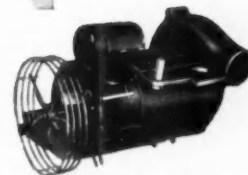


1/2 Horsepower two-stage "by-pass" unit (motor separately ventilated) for light duty commercial vacuum cleaners.

for your power-driven
product with

Lamb Electric

SPECIAL APPLICATION
FRACTIONAL HORSEPOWER
MOTORS



Two-pole 60 cycle AC motor incorporating propeller fan and high speed blower driven through step-up gear train. Frame 4 1/4 x 1 3/4

You get the *right* motor to assure the product performance desired...

You get the *right* motor to meet weight and space requirements...

You get the *right* motor cost-wise, too, because...

Lamb Electric motors are *engineered* to the application and *mass-produced* to obtain the most favorable cost.

May we demonstrate these advantages of our nearly half-century of experience in the small motor field?

NEW! 8-page Folder describes these and other Lamb motors. Send for your copy.

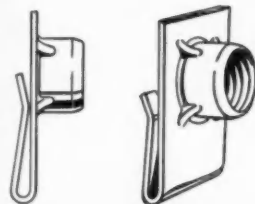


THE LAMB ELECTRIC COMPANY • Kent, Ohio

A Division of American Machine and Metals, Inc.

In Canada: Lamb Electric—Division of Sangamo Company Ltd.—Leaside, Ontario

DOT makes J NUTS **with a difference**



- FLUSH SEATING
- SELF-RETAINING
- SELF-TENSIONING
- LOW COST
- CAREFUL WORKMANSHIP

It takes a little extra care in the drawing operation to make really reliable J-nuts in volume but it's well worth the trouble. It reduces internal strains in the barrel so that DOT J-nuts stand up to working loads considerably better than the average fastener of similar construction.

Available in three thread sizes (5/16"-18 and 24, 1/4-20) and to fit three ranges of material thickness (.030" to .065"), DOT J-nuts are made of carbon steel. They hold themselves in place over stamped holes so that preassembly is practical in cases where the actual bolting operation comes at the end of a series of other operations.

Full details on request.

CARR FASTENER COMPANY

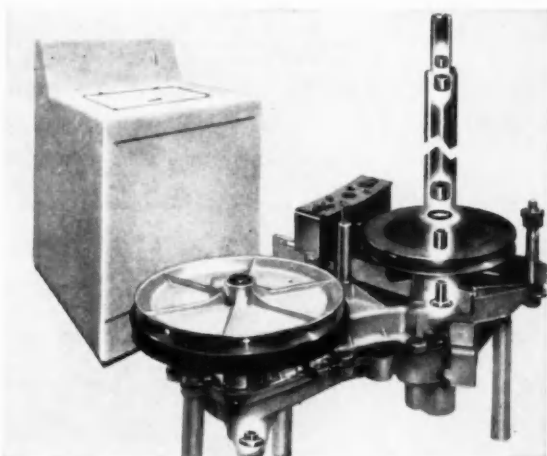
Division of United-Carr Fastener Corporation, Cambridge 42, Mass.

MAKERS OF

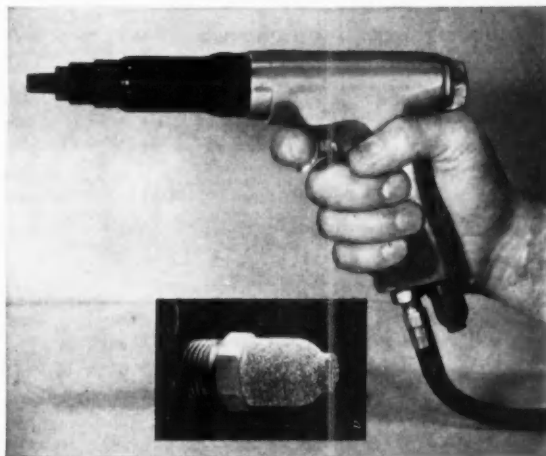
DOT

FASTENERS

BOOST PRODUCT APPEAL with **OILITE**



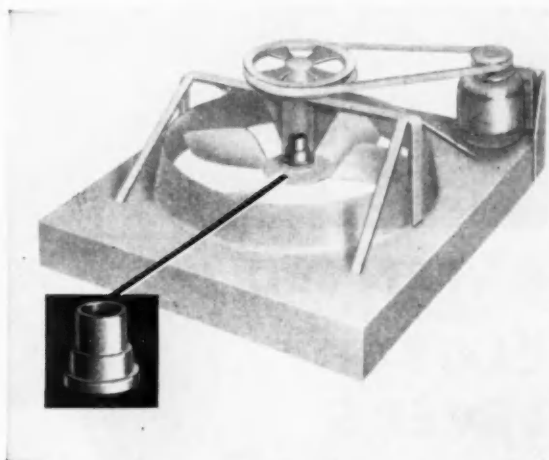
This "best seller" automatic washer is more reliable, more economical with Oilite oil-cushioned bearings.



Oilite filter-diffusers are now boosting the sale of new air tools by making them practically "noiseless".



Dust, grit, shocks — plus payloads up to 34 tons — are all in a day's work for these tough Oilite bearings.



This self-lubricating Oilite bearing refused to fail even after 125 years' service in accelerated life tests.

Quality-built **OILITE®** bearings, parts and filters help sell many products by improving performance and keeping costs down. Mass-produced at Amplex's 2 modern plants, even the most intricate parts are die-pressed directly into

** Only Chrysler Makes Oilite*

ready-to-use, close tolerance shapes. Amplex engineering, research and production know-how can probably help you. Why not contact your Oilite representative today? Look for him in the Yellow Pages under "bearings—Oilite" or write Dept. K-4.



SINCE 1929



the most trusted name in powder metallurgy!

AMPLEX DIVISION

CHRYSLER CORPORATION, DETROIT 31, MICHIGAN
SELF-LUBRICATING BEARINGS • PRECISION PARTS • METAL FILTERS • FRICTION UNITS

MORE GOVERNMENT CONTRACT AWARDS

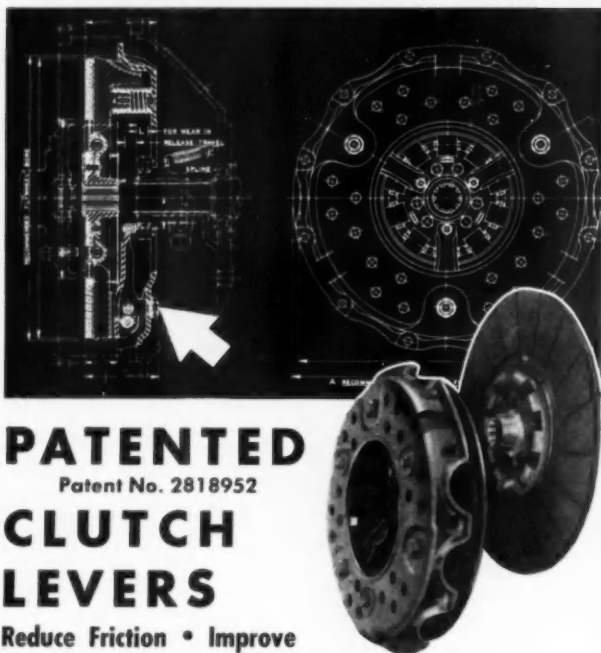
(Continued from page 97)

B. F. GOODRICH CO., AVIATION PRODUCTS DIV., Akron, Ohio
Wheel assys, various aircraft, 171 ea—\$176,720
GOODYEAR TIRE & RUBBER CO., Akron, Ohio
Spare parts, various aircraft—\$36,614
GOODYEAR TIRE & RUBBER CO., Akron, Ohio
Wheel assys, main, aircraft, 2,872 ea—\$1,113,157
GRAND CENTRAL ROCKET CO., Redlands, Calif.
Rocket engines and motors—\$426,572

HYDRO-AIRE, INC., Burbank, Calif.
Spare parts, aircraft—\$1,176,152
HYSTER CO., Portland, Ore.
Truck, forklift, 3 ea—\$28,787
INTERNATIONAL HARVESTER CO., CONSTRUCTION EQUIPMENT DIV., Melrose Park, Ill.
Tractor, full tracked, 251 ea—\$4,271,287
INTERNATIONAL HARVESTER CO., Washington, D. C.
Truck, panel, 1,049 ea—\$2,386,914
INTERNATIONAL HARVESTER CO., Washington, D. C.
Trucks, 84 ea—\$295,270
KINGHAM TRAILER CO., INC., Louisville, Ky.
Semi-Trailer Van, 300 ea—\$1,332,803
LE TOURNEAU-WESTINGHOUSE CO., Peoria, Ill.
Crane, mobile, multi-purpose, 6 ea—\$274,256

LEE RUBBER & TIRE CORP., Conshohocken, Pa.
Tires, 3,153 ea—\$214,347
LOCKHEED AIRCRAFT CORP., Burbank, Calif.
Spare parts, aircraft—\$26,966
MACHINEERY ASSOCIATES, INC., Wynnewood, Pa.
Engine lathe, 11 ea—\$111,958
MACK TRUCKS, INC., Washington, D. C.
Engine gasoline/w accessories and clutch assy—\$339,140
MBI EXPORT & IMPORT LTD., Bronx, N. Y.
Boring machine, horizontal, 1 ea—\$44,741
MEMPHIS COACH CO., INC., Memphis, Tenn.
Automobile, ambulance, 53 ea—\$253,687
MICROMATIC HONE CORP., Detroit, Mich.
Honing machine, vertical, 2 ea—\$61,404
MOHAWK RUBBER CO., Akron, Ohio
Tire, 15,125 ea—\$356,950
NORTH AMERICAN AVIATION, INC., Canoga Park, Calif.
Rocket engines—\$412,500
NORTH AMERICAN AVIATION, INC., Los Angeles, Calif.
Spare parts, aircraft—\$30,706
OSHKOSH MOTOR TRUCK INC., Oshkosh, Wis.
Snowplow, truck mtd., 160 ea—\$5,647,206
PACIFIC TIRE & RUBBER CO., Oakland, Calif.
Tire, 6,836 ea—\$246,919
PALMER MFG. CO., Cleveland, Ohio
Bomb trucks, 65 ea—\$287,690
PITMAN MFG. CO., Grandview, Mo.
Truck, 1 ea—\$14,019
PRATT & WHITNEY CO., INC., West Hartford, Conn.
Boring machine, vertical—\$32,287
ROCKFORD MACHINE TOOL CO., Rockford, Ill.
Milling machines, 1 ea—\$39,798
RYAN AERONAUTICAL CO., San Diego, Calif.
Spare parts, aircraft, 35 to 5,000 ea—\$95,687
SEAGRAVE CORP., Columbus, Ohio
Trucks, 1 ea—\$38,682
SILENT HOIST & CRANE CO., INC., Brooklyn, N. Y.
Crane, truck, warehouse—\$29,367
SILENT HOIST & CRANE CO., INC., Brooklyn, N. Y.
Truck, forklift, 15 ea—\$270,900
STANDARD ELECTRICAL TOOL CO., Cincinnati, Ohio
Grinder, disc, pedestal type—\$39,869
UHRDEN, INC., Dennison, Ohio
Crane, portable, hydraulic, 302 ea—\$82,819
UNITED AIRCRAFT CORP., HAMILTON STANDARD DIV., Windsor Locks, Conn.
Propeller control assys, aircraft—\$134,815
GEORGE E. VIERECK & CO., INC., Washington, D. C.
Machine, milling, 3 ea—\$48,010
WALTER MOTOR TRUCK CO., Ridgewood, Long Island, N. Y.
Trucks, 2 ea—\$25,010
WATSON AUTO EQUIPMENT CO., Washington, D. C.
Trucks, 14 ea—\$19,674
WESTERN ELECTRIC CO., INC., New York, N. Y.
NIKE spare parts & components—\$1,561,594
WESTFALL EQUIPMENT CO., Portland, Ore.
Tractor, wheeled, 1 lot—\$359,318
WILLYS MOTORS, INC., Toledo, Ohio
Body, truck, 378 ea—\$45,504
WILLYS MOTORS, INC., Toledo, Ohio
Trucks & spare parts, 470 ea and 450 lots—\$969,077
WILLYS MOTORS INC., Washington, D. C.
Trucks, 70 ea—\$156,103
YALE & TOWNE MFG. CO., MATERIALS HANDLING DIV., Phila., Pa.
Tractor, aircraft towing, 208 ea—\$677,122
YALE & TOWNE MFG. CO., Philadelphia, Pa.
Truck, forklift, 384 ea—\$1,362,883

ROCKFORD



PATENTED Patent No. 2818952 CLUTCH LEVERS

Reduce Friction • Improve
clutch release action • and
Prevent lever throw-out

Patented rolling fulcrum pin action, in the release lever, results in much less friction and wear, and smoother release operation in this clutch than in some other types of clutches. Pin automatically returns to original position. Carefully balanced levers avoid lever throw-out at high speeds.

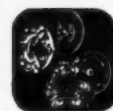
SEND FOR THIS HANDY BULLETIN
Gives dimensions, capacity tables and complete specifications. Suggests typical applications.

ROCKFORD Clutch Division BORG-WARNER

315 Catherine St., Rockford, Ill., U.S.A.

Export Sales Borg-Warner International — 36 So. Wabash, Chicago 3, Ill.

CLUTCHES



Small
Spring Loaded



Heavy Duty
Spring Loaded



Oil or Dry
Multiple Disc



Heavy Duty
Over Center

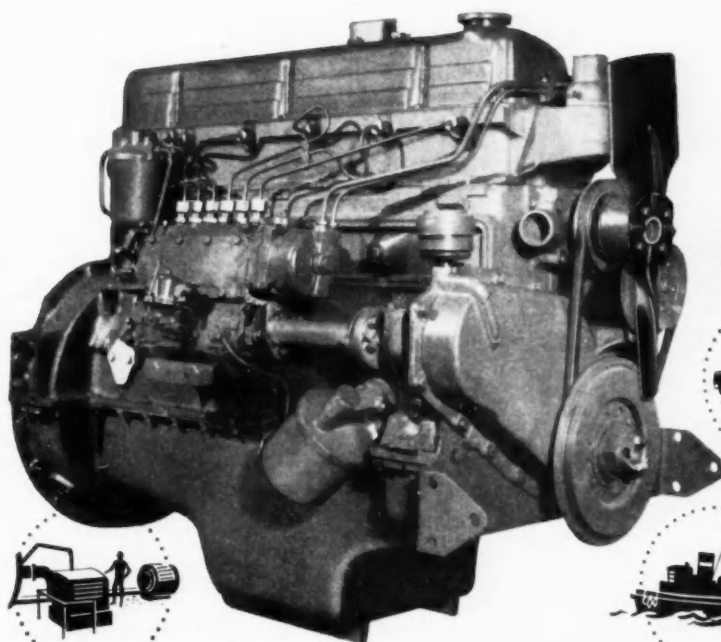


Power
Take-Offs



Speed
Reducers

Whatever your application:



Modern **FORD DIESELS** are designed to give you the dependability you need...the economy you're looking for!

If your job demands dependable, economical power day after day, consider a Ford 220- or 330-Diesel installation.

Simple in design and modern throughout, both Diesels offer heavy-duty 12-volt ignition systems for fast all-weather starting . . . overhead-valve construction for higher engine compression, more power . . . and four-way fuel injectors for efficient combustion, greater operating economy.

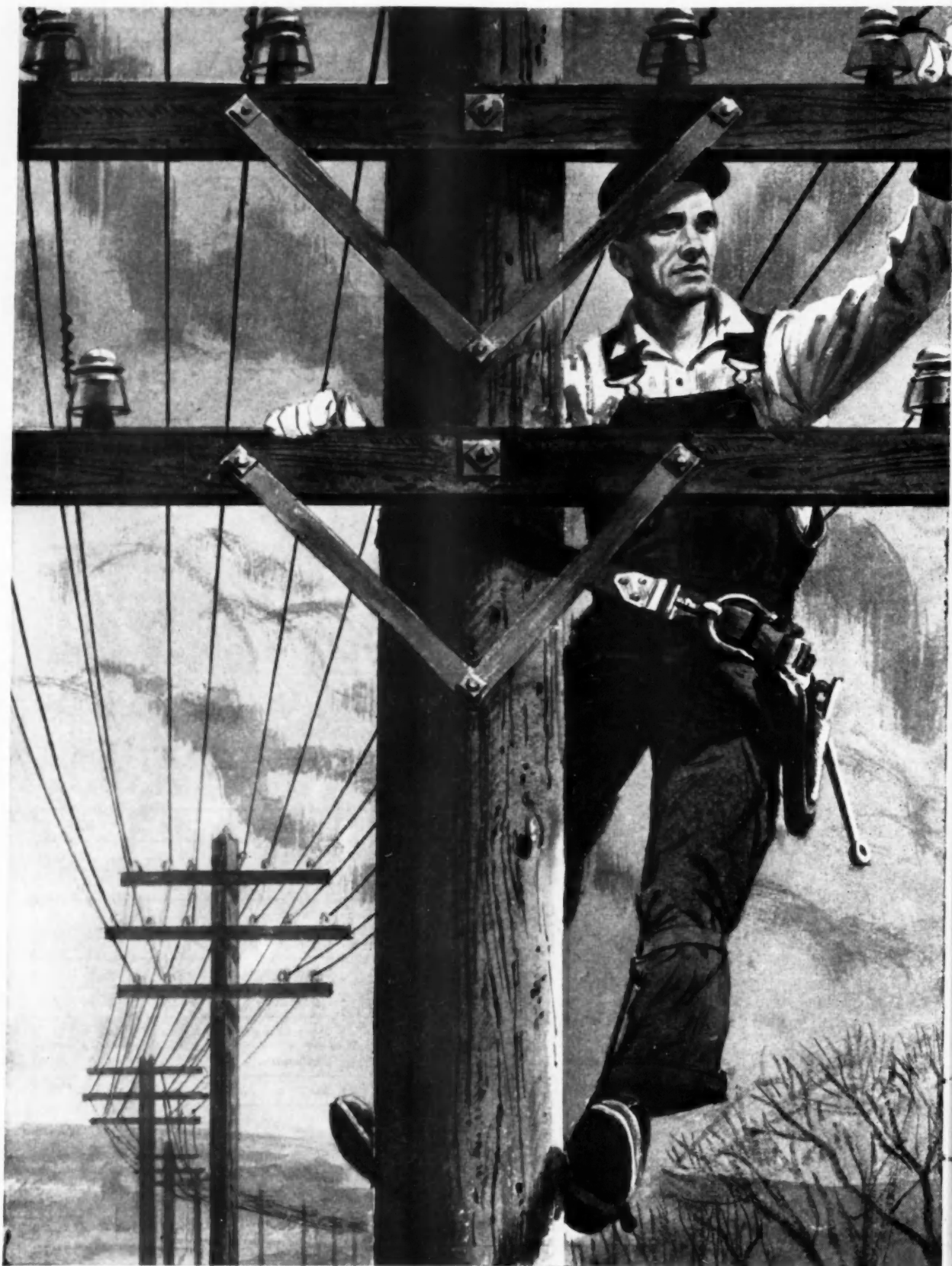
Quality-built by the most modern production methods, these Diesels are also low in initial cost. And because prompt Ford service is available almost everywhere, Ford Diesel users can count on a minimum amount of downtime.

For these reasons and many more, a Ford Diesel can cut your operating costs . . . handle a greater work load. Therefore, it will pay you to specify Ford Diesels for original installation or for engine replacements. Write for details today to: Industrial Engine Department, Ford Division of Ford Motor Company, P.O. Box 598, Dearborn, Mich.

ENGINE SPECIFICATIONS		220	330
Basic Model		X	Y
Number of Cylinders		Four	Six
Bore and Stroke—Inches		3.94 x 4.52	3.90 x 4.52
Displacement—Cubic Inches		220	330
Brake Horsepower	Dynamometer	60 @ 2250	96 @ 2250
	Continuous	48 @ 2250	77 @ 2250
Torque	Dynamometer	151#' @ 1600	236#' @ 1600
	Continuous	121#' @ 1600	189#' @ 1600
Compression Ratio		16 to 1	16 to 1



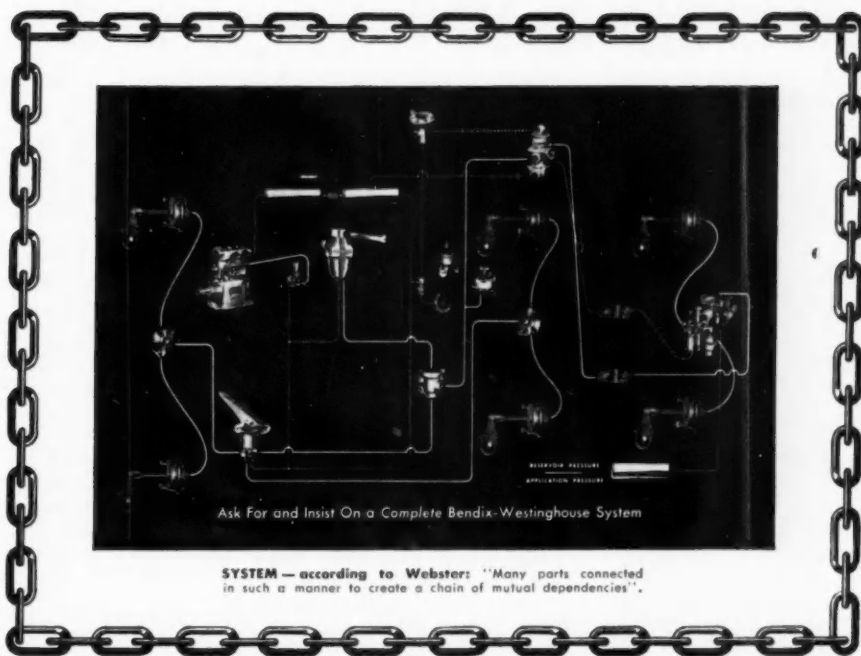
See you at the OIL SHOW • Tulsa • May 14-23 • Booth 6-E



Dependable systems demand systems planning and engineering

It's true with communications systems and it's equally true with air brakes. For peak performance, both systems depend upon operating compatibility of a wide variety of precise and inter-related devices. In *any* system you can, of course, buy one component here, another component there, but to get the most efficient, most reliable, most economical performance you need a *complete* chain of components, or devices, each system-engineered to do a specific task with predetermined accuracy.

You buy such a chain when you specify *complete* Bendix-Westinghouse Air Brake Systems for your vehicles. You get top performance for a longer period and at lower over-all cost. It's one more reason why it pays to specify Bendix-Westinghouse Air Brakes . . . *complete* air brake systems for which we accept full and complete responsibility. Fleet operators know this. And that is why more vehicles travel more miles with Bendix-Westinghouse Air Brakes than with all other air brakes combined.



Bendix-Westinghouse



AUTOMOTIVE AIR BRAKE COMPANY

General offices and factory—Elyria, Ohio. Branches—Berkeley, Calif. and Oklahoma City, Okla.



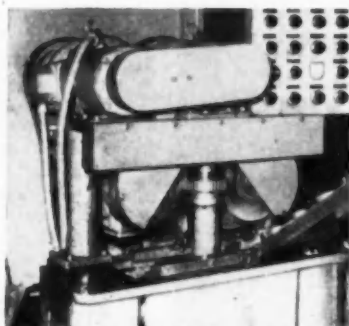
BEFORE BRUSHING—Automotive clutch component . . . with sharp edges plus fine machining chips and burrs still carried inside teeth.



AFTER BRUSHING—Edges and surface junctures are uniformly precision blended. Chips and burrs are thoroughly removed to help assure troublefree operation of the installed part.

Precision finish . . . in 7 seconds flat

...capacity 360 parts-per-hour with OSBORN Power Brushing



TWIN POWER BRUSHES deburr and edge-blend these parts on 7-second cycles. Osborn 6" Monitor® Brushes—operating at 1750 rpm—do the job at high production rates. Quality is excellent . . . cost is low.

If you precision finish parts, and want to do the job faster . . . with improved quality . . . at less cost—today's Osborn Power Brushing methods can help you do it.

For example—this leading automotive parts manufacturer uses a dual-brush setup to automatically deburr and edge-blend precision clutch parts. In addition to the versatility and precise quality control he's afforded by Osborn Power Brushing—he finds finishing operations are done faster and at significantly lower cost.

It's typical of how you can pinpoint savings, too. An Osborn Brushing Analysis—made in your plant at no cost or obligation—is the first step. Write us for full details. The Osborn Manufacturing Company, Dept. E-76, Cleveland 14, Ohio.



BRUSHING MACHINES • BRUSHING METHODS
POWER, PAINT AND MAINTENANCE BRUSHES • FOUNDRY PRODUCTION MACHINERY



Free world nations spent a record total of \$17.13 billion on road building, maintenance, and administration in 1958, compared with \$15.04 billion in the previous year.

U. S. spending for highways—the largest for any nation—totaled \$9.93 billion in 1958, a 10 per cent increase over 1957.

West Germany led the world outside the U. S. in total highway spending in 1958 with \$1.073 billion, up 21.5 per cent over the previous year.

The U. S. again had the most miles of highway in existence (3,429,801 miles), and the most motor vehicles (68,398,000).

The smallest road network in the world is in the British colony of Gibraltar (17 miles). Gibraltar has 3321 motor vehicles.

Scientists and engineers at a turbine engine company in two years made 1004 inventions to improve the efficiency of jet propulsion.

Major U. S. companies spent nearly \$5 billion abroad in 1957 for plant and equipment for their foreign branches and subsidiaries.

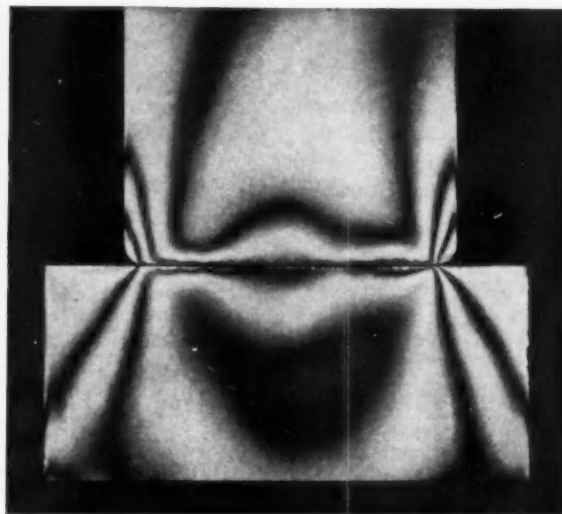
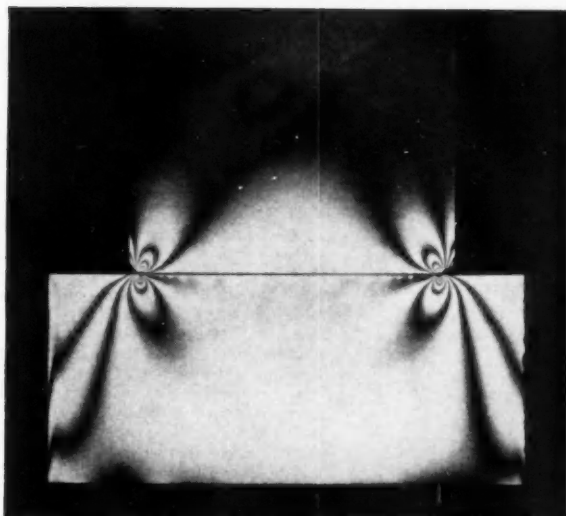
To insure reliability and accuracy, more than 100 inspections and tests are made of a typical aircraft instrument such as a flow meter.

Use of tape-controlled milling techniques by the aircraft and missile industry cuts three out of every four hours needed to set up a conventional milling machine.

Wind tunnel testing of one subsonic aircraft cost \$323,000, but the cost of a supersonic aircraft tunnel test totaled \$1,185,000.



ROLLER BEARING LIFE AND CAPACITY LINKED TO STRESS DISTRIBUTION



These reproductions of photoelastic studies contain important evidence for every engineer and designer concerned with the performance and selection of roller bearings. In these photographs, the alternate dark and light areas, called fringes, indicate not only the magnitude of stress but also the stress distribution. The photographs were taken by Bower Research Engineers during a study of stress distribution in roller bearings.

The subjects represent rollers and raceways of two roller bearings under identical loads. The illustration at the left shows a roller of conventional design. The illustration at the right shows a Bower "Profiled" roller. That is, the roller is precision ground with a large radius generated along the body of the roller—a predetermined and controlled distance from each end.

The conventional roller photo (left) clearly shows how, under load, stress concentration builds up in and near the

roller ends. This is called edge-loading. Such areas of concentrated stress are the breeding grounds for metal fatigue and eventual bearing failure.

In the photo of the "Profiled" roller (right) stress lines can be seen uniformly distributed across the whole length of the roller and raceway. There are no points of excessive stress concentration, consequently no starting points for early fatigue. Such a "Profiled" roller exhibits a great advantage in improved load carrying capacity, a most important bearing requirement.

Under actual operating conditions, Bower "Profiled" roller bearings show a considerably longer life at higher

speeds and under greater loads than conventional roller bearings.

Because of this, and of other Bower features to be discussed in later technical reports, we suggest that you consider the advantages of Bower bearings in satisfying your future bearing requirements.

★ ★ ★ ★

Bower engineers are always available, should you desire assistance or advice on bearing problems. Where product design calls for tapered roller bearings or journal roller assemblies, Bower makes these also in a full range of types and sizes.

BOWER ROLLER BEARINGS

BOWER ROLLER BEARING DIVISION — FEDERAL-MOGUL-BOWER BEARINGS, INC., DETROIT 14, MICHIGAN

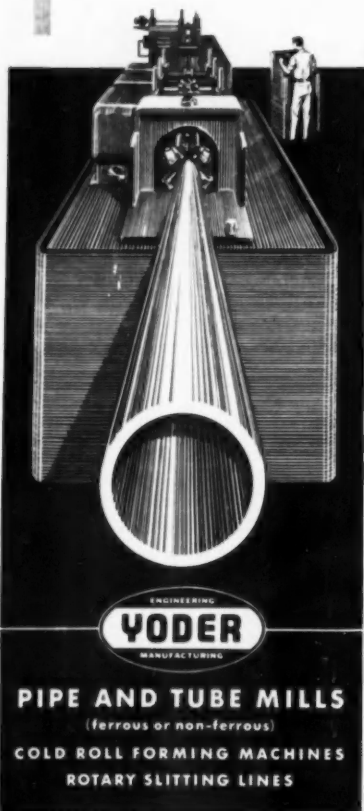
YODER

Pipe and Tube Mills

Product dependability—integrity of manufacture—engineering for specific production needs have all contributed to establish Yoder equipment as the industry standard of excellence. Since 1909 Yoder-built machinery, including Pipe and Tube Mills, Roll Forming Equipment and Rotary Slitters, have earned world-wide customer satisfaction and recognition.

Profit from Yoder's years of engineering and service experience. Send today for the illustrated Yoder Pipe and Tube Mills Book.

THE YODER COMPANY
5553 Walworth Ave., Cleveland 2, Ohio



Circle 161 on Inquiry Card, for more data

How to Fixture Honeycomb for Brazing

(Continued from page 47)

sand, the ease with which the sand may become contaminated, and the possibility of blowing out a portion of the sand seriously offset its advantages. The welded seal in the same figure is considerably more positive, but takes more time to effect. A newer idea in seals, a mechanical closure on a cone, has a great deal of merit.

The most difficult sealing problem is occasioned by the passage of thermocouples and other tubes into the retort to service the fixture. One solution, Fig. 8, utilizes a trough which may be filled with sand to seal an aperture in the retort top. The remainder of the seal may be sand or any of the other methods discussed.

The ultimate in retort design is to integrate furnace and cooling systems into a single facility. Figure 9 is an example of this advanced design. Horizontally moving furnaces and air cooling bells service multiple retort stations. Retorts are capable of vertical motion within a water jacket and parts within the retort may be independently elevated.

Even without the benefit of large quantity production, tools and fixtures can be simplified, combined or even eliminated in the fabrication of brazed honeycomb structures to help reduce costs. Accompanied by simplifications in other process areas, tooling innovations can make sandwich structures competitive with conventional fabrication. ■

Classified Advertisements

AGENTS WANTED: Leading manufacturer of wet and dry type storage batteries now setting up to sell through manufacturer's agents. Many territories available. Give complete resume first letter. Box 19, Automotive Industries, 5601 Chestnut St., Philadelphia 39, Pa.

JOBBERS WANTED: We manufacture Koh-Kleen (ground corn cobs) for deburring, burnishing, polishing and soft grit blasting of metals; metal stamping absorbents, etc. Nationally advertised. COEVAL, INC., Dept. E, St. Joseph, Illinois.

NEW! GLO-ESCENT LIGHTING



... the practical application of the phenomenon of ELECTROLUMINESCENCE

Miller GLO-ESCENT Lamps are laminations of many materials. Basically, they consist of a layer of phosphor between two electrical conductors. When current is applied, the entire surface of the panel emits light. They are ideal for use as dials, control panels, signs or decorative effects. New, patent-applied-for manufacturing techniques make it possible to fabricate these panels into virtually any shape for incorporation into your product.

GLO-ESCENT Lamps operate on AC only, 25 cycles or more. Direct current may be used in conjunction with inverters or oscillators. There are no expendable lamps, filaments or gases and average life is 30,000 hours. Current consumption is only 0.1 milliamp per square inch of lighted surface.

Miller Dial & Name Plate Company provides complete custom fabrication and design services to meet your particular problems.

SPECIAL OFFER: An actual GLO-ESCENT Lamp will be sent to you on a \$5.00 memo billing basis, which will be credited on your first production order or cancelled on return of the lamp. Technical brochure available on request.



Manufacturers of FOILCAL, light weight metal name plates; FOTOFOIL, custom name plate process, edgedlight panels and a full line of custom identification products.

Circle 162 on Inquiry Card, for more data



Give your braided hose high strength and low growth with Celanese **FORTISAN-36** rayon

Braided hose reinforced with strong Celanese FORTISAN-36 gives you a unique combination of low growth and high burst resistance—plus the added advantage of reduced weight. FORTISAN-36 rayon yarn neither shrinks nor stretches under the influence of heat and mois-

ture. This means better quality control during processing and stepped-up performance of the final product. For information on Celanese FORTISAN-36 and its uses in industry, write to: Celanese Corporation of America, Sales Development Dept., Fibers Div., Charlotte, N.C.

Celanese® Fortisan®

DISTRICT SALES OFFICES: 180 Madison Ave., New York 18, N. Y. • Room 10-141 Merchandise Mart, Chicago 54, Illinois
Western Merchandise Mart, Room 478, 1355 Market St., San Francisco, California
P. O. Box 1414, Charlotte 1, North Carolina • 200 Boylston St., Chestnut Hill 67, Massachusetts

EXPORT SALES: Amcel Co., Inc. and Pan Amcel Co., Inc., 180 Madison Ave., New York 16, N. Y.

IN CANADA: Chemcell Fibres Limited, 1600 Dorchester Street West, Montreal, Quebec.

Fortisan-36 . . . a *Celanese* industrial fiber

When buying
aluminum for your
product...

Grille and headlight trim



Passenger bus body panels

...it pays to
check with
ANACONDA ALUMINUM



Door and fender trim

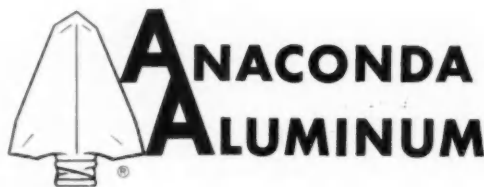
That's because Anaconda Aluminum combines the two features labeled "most wanted" by aluminum buyers in selecting a source of supply.

First: Anaconda Aluminum craftsmen will custom-produce your order, constantly checking and double-checking it to be sure your specifications are met precisely. We produce a full range of aluminum in all forms—pig and ingot, coiled and flat sheet, rod, bar, structurals, tubular and other extruded shapes.

Second: You'll like the way Anaconda Aluminum's flexible operations will schedule your order fast, and ship it on time. This flexibility is designed into Anaconda Aluminum's new facilities for this one reason—to give you the service you want!

Talk over your next aluminum order with your local Anaconda Aluminum representative . . . or write our General Offices, Dept. AI-4, Louisville 1, Kentucky.

**Every industry has one member
who specializes in customer satisfaction**

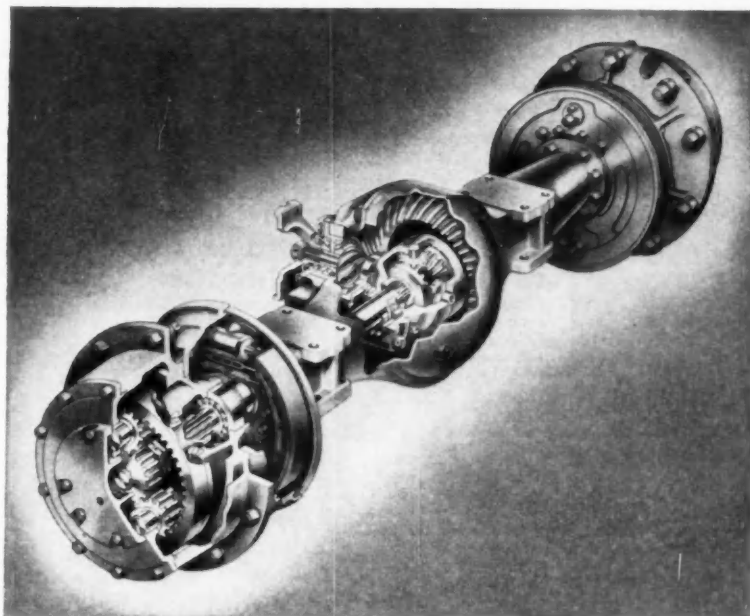


ANACONDA ALUMINUM COMPANY • GENERAL OFFICES, LOUISVILLE, KENTUCKY

TORQUE TALK

ABOUT

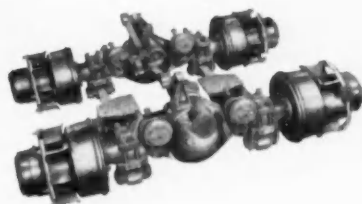
**CLARK®
EQUIPMENT**



Rugged Planetary Axles Available in Tandem, Too!

The same advantages you get with individual Clark Planetary Axles can also be yours with matched Clark Planetary Axles in tandem. Far less torque on axle shafts. Fewer broken axles. Stronger, lighter weight, in both on and off-highway rigs.

Moreover, with tandem Clark Planetary Axles, you eliminate massive axle shafts that twist and shear near differential splines. You cut deadweight, too; can haul more *payload*.



HOW TO PUT MORE POWER WHERE THERE'S WORK TO BE DONE

Horsepower and work loads are going up. More and more strains are being put on axle shafts. And more and more ordinary axles are breaking.

You can eliminate many of these troubles with Clark Planetary Axles.

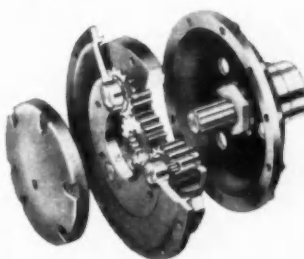
These job-proved units by putting the final power reduction in the *hub*, take 70% of the torque load off the shaft. They virtually eliminate shaft windup and surge, cause of most

broken axles.

If you run trucks, tractor shovels, dozers, scrapers or other heavy-duty on or off-highway vehicles, you will find it well worthwhile to get the facts on the complete line of Clark Planetary Axles—covering a range of capacities from 6500 lbs to 110,000 lbs—each a combination of maximum rugged strength with minimum size and weight.



PRIMARY REDUCTION in Clark Planetary Axles is in axle center section, by spiral bevel pinion and gear.



FINAL REDUCTION in hub, by sun gear splined to axle shaft. Ring gear is fixed; wheel is driven by three revolving planet gears.

Clark Planetary Axles are now available in four sizes: from 28,000 lbs to 120,000 lbs ground loading capacity. All have through-type drive for minimum mounting height and additional overhead clearance. Equalizer beam and torque rods are rubber mounted, need no lubrication. Smaller axle banjo sections provide maximum under-axle clearance. Full floating types have housings designed for static loads imposed by crane carriers and other off-highway vehicles.

Get a smooth flow of power

Mobile or stationary, *any* power plant will do *more* work with *less* wear when connected to a Clark Torque Converter. These units provide a smooth flow of power, eliminate shock-loading, reduce wear on all parts of the power train and engine. There's a Clark size to fit your needs: 15 to 800 hp, 9 to 28 inch diameters.

FOR FURTHER INFORMATION...

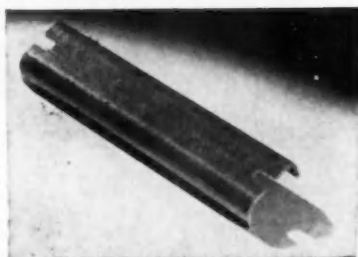
and full details on any of Clark's automotive components, simply address a card or a call to:

CLARK EQUIPMENT COMPANY
AUTOMOTIVE DIVISION
Buchanan 2, Michigan

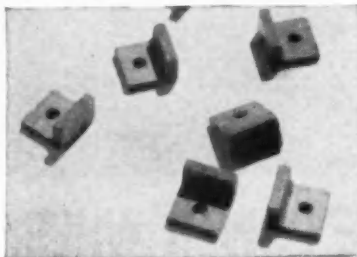


C D F MACHINES TO CLOSE TOLERANCES.

Great accuracy is required to furnish ball bearing race retainers made from fine weave cotton fabric Dilecto rolled laminated plastic tubing. When plastics can do a better job than other materials, come to C-D-F for technical and production help.



C D F PIONEERED IN POST-FORMING of laminated plastics. This technique gives you stronger, more versatile insulating parts with lower costs. This aircraft channel strip is an example of simple post-forming.

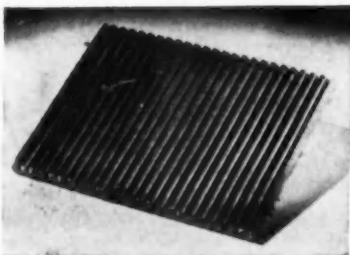


C D F DOES THE UNUSUAL. These rubbing blocks are made from fine-weave cotton cloth Dilecto molded tubing that has been pierced and cut. The part gains in mechanical strength — the product gets longer service life.

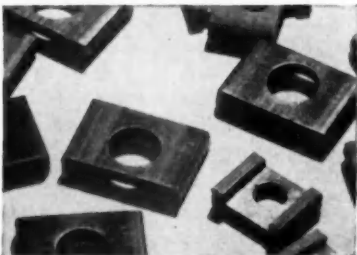


C D F SPECIALIZES IN AUTOMATIC SCREW MACHINING of plastic components. These breaker arm bushings are made from Dilecto paper base rolled tubing on high speed machines by men who know and use cost saving methods.

Yes, C D F is a big reliable source for fabricated plastics!



C D F SERVES MANY INDUSTRIES with fabricated specialties. A great amount is concentrated in the automotive and allied fields. This aircraft part has a corrugated surface on a strong woven asbestos laminated base.



C D F IS A PUNCHING SPECIALIST on these starter solenoid insulators. This is XX-26 Dilecto molded channel strip, pierced and punched to length. Special C-D-F punching grades give you lower costs, faster assembly, fewer rejects.



C D F COMES UP WITH THE ANSWERS to insulating problems. These unique snap-in grommets are easy to insert, spring out and hold tight. Write for samples. The chances are that C-D-F is already making the answer to your problem.

See our general catalog in Sweet's Design File for more technical data, the address and telephone number of your nearest C-D-F sales engineer. Also, write for detailed information, samples, or send us your print for quotation.

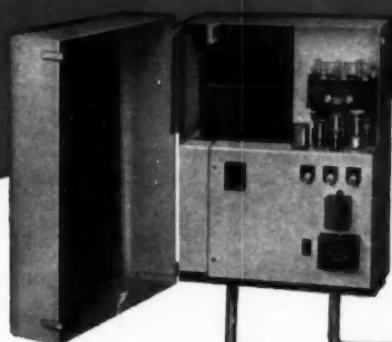


CONTINENTAL-DIAMOND FIBRE

A SUBSIDIARY OF THE *Budd* COMPANY • NEWARK 2, DEL.



Drive Package Provides Infinitely Adjustable Speeds from AC Power Source



CONTROL
PANEL



CONTROL
STATION

The complete Dynamatic power package includes all components required to provide infinitely adjustable speeds from an alternating current power source. A Dynamatic Ajusto-Spede® or Dynaspede® Drive, with electronic control and pushbutton station, satisfies the requirements of almost any application where proper machine operation or material processing depends upon control of operating speeds.

The compact control panel may be remotely mounted to conserve valuable space on the driven machine. The pushbutton station at the operator's position puts vital controls conveniently at the operator's fingertips and requires a minimum of space.

Speeds are infinitely adjustable from 0 RPM to full output speed, and accurate speed regulation may be obtained from 100 RPM to full output speed.

Ajusto-Spede® Drives, available in ratings of 1/4 horsepower to 75 horsepower, are air-cooled. Dynaspede® Drives, rated from 3 to 75 horsepower, are liquid-cooled. Raise your productive efficiency with Dynamatic eddy-current units.

DYNAMATIC
AJUSTO-SPEDE DRIVE



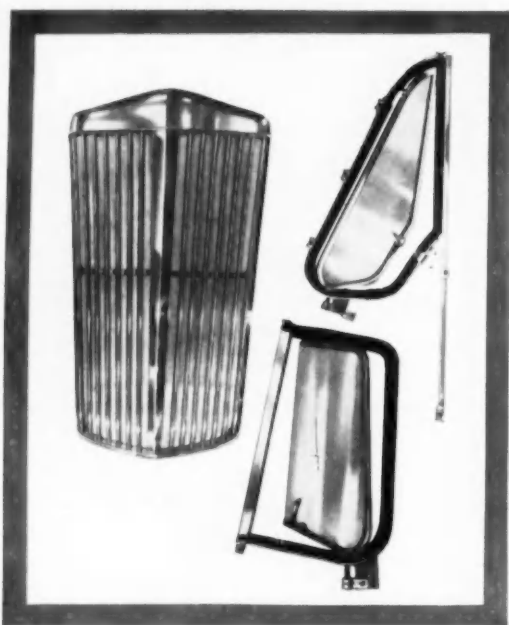
*Send for Illustrated Literature Describing
Dynamatic Adjustable Speed Drives*

EATON

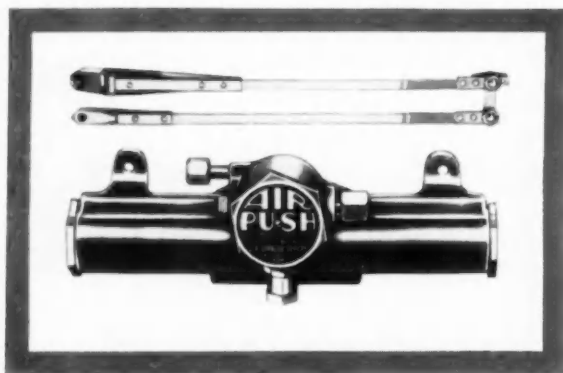
DYNAMATIC DIVISION
MANUFACTURING COMPANY
3307 FOURTEENTH AVENUE • KENOSHA, WISCONSIN

Problem-Solving Products from Republic

FUNCTIONAL STAINLESS STEEL IS CORROSION-RESISTANT, STRONG, WEIGHT-SAVING, READILY FORMED



The high strength-to-weight ratio of stainless steel permits the use of slimmer channels and frames in passenger car and truck sash. Protected by stainless, glass breakage is less likely. Strength, dent-resistance, and corrosion-resistance make stainless ideal for radiator grills. Manufacturer—Excel Corporation, Elkhart, Indiana.



Stainless steel makes an important contribution to the safe operation and maintenance of windshield wipers. Stainless steel's strength assures resistance to breakage or distortion. Light, strong design reduces dead weight that the wiper motor must move. Elasticity of stainless gives the blade the proper pressure on the glass. The wiper arms are protected against the slow and insidious weakening effects of corrosion. Manufacturer—Sprague Devices, Inc., Michigan City, Indiana.

Always right, always bright stainless steel, the optimum metal for trim and brightwork, is showing up in ever-increasing functional applications.

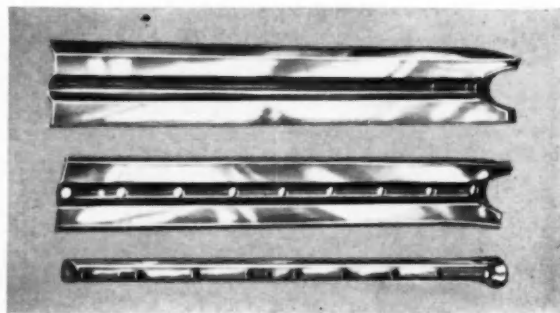
The reason? Stainless steel offers automotive part and equipment manufacturers and designers a combination of qualities unobtainable in any other commercial metal.

Stainless steel parts are tough and strong, yet lightweight. They offer outstanding resistance to heat, wear, and abrasion. They stubbornly resist rust and corrosion. Maintain their great strength through extremes of heat and cold.

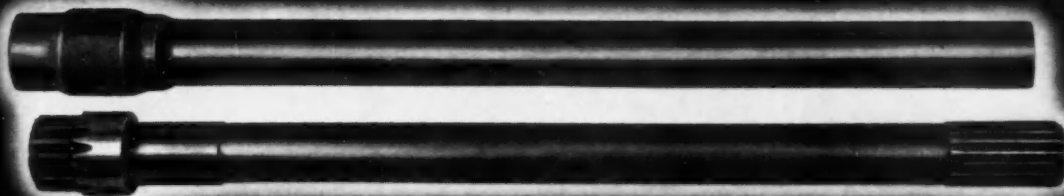
Stainless is readily formed into desired shapes and designs on present equipment with little or no change in procedure and often at lower ultimate cost. Conventional welding techniques, currently in use on production operations, permit the combining of strong, lightweight stainless to carbon steel panels. The result is an over-all reduction in weight without loss of strength or safety, and a structural member that is both functional and decorative.

The functional stainless steel parts and equipment illustrated on these pages represent only a few of many current applications. Others include: mufflers, head gaskets, exhaust manifold butterfly valves, fasteners, heat exchangers. Future applications are practically unlimited.

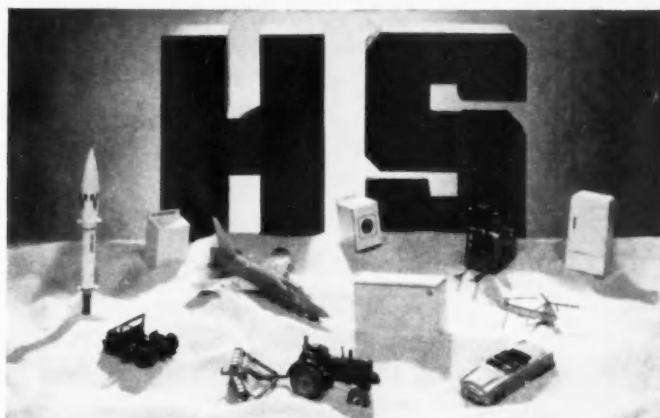
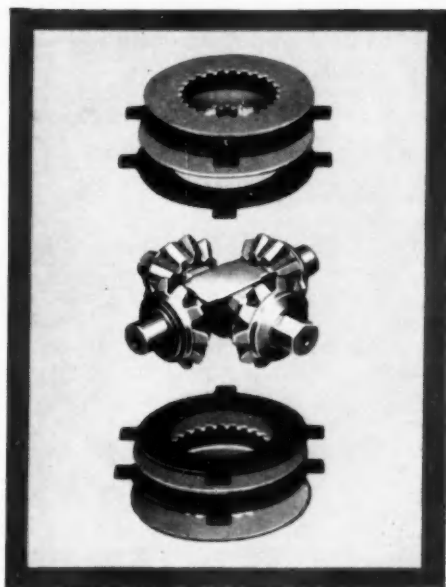
Republic Stainless Steel metallurgists and engineers are always available for consultation on development, selection, application and processing. No obligation for their services. Just mail the coupon.



Formability, corrosion-resistance, and cost were prime factors in switching to stainless steel from brass in this engine water distribution tube. Stainless was easily fabricated on existing tools. It took the constant flow of hot water and anti-freeze chemicals in stride. The greater strength of stainless virtually eliminated loss from bent or damaged tubes. Photo sequence shows fabricating operations: (1) Blank of .010" stainless strip after initial drawing and embossing, (2) Same blank after piercing of water outlet holes trimming of flanges, (3) Completed tube after roll-forming and lock seaming. Produced by Pontiac Motor Division of General Motors Corporation.



NEW FABRICATING PROCESS MEANS ECONOMY. Ford Tractor power take-off countershafts cost less to produce using Republic Die-Form blanks, as compared with previous materials. Blank is shown at top, completed shaft below. Die-Form is a new method of cold forming hot rolled carbon, alloy, or stainless steel bars into multi-diameter blanks ready for final machining. Because Die-Form blanks closely approximate the completed part, scrap losses are negligible. Improved machinability permits savings through use of higher speeds and feeds. Mail coupon for complete facts.



NEW HIGH STRENGTH POWDER, TYPE HS 6460, opens the way for new applications using sinterings for highly stressed parts. Type HS 6460 can be used with existing operating equipment. It provides a minimum tensile strength of 60,000 psi at 6.4 density as sintered, 100,000 psi heat treated. Type HS 6460 maintains its dimensional characteristics after sintering—less than .004 inches per inch shrinkage from die size at 6.4 density. Available in production quantities up to and including 12 tons, or in multiples thereof. Mail coupon for technical data sheet.

SUPER TOUGHNESS AND STRENGTH at critical points are provided by Republic Alloy Steels in the Powr-Lok Differential developed by the Dana Corporation, Toledo, Ohio. Dana engineers have reduced the possibility of mechanical breakdown in clutch rings and side gears to an absolute minimum by forging these parts from Republic Hot Rolled 8615 Alloy Bars. This fine steel offers superior strength and toughness to withstand torque, fatigue, shock, and stress. Uniform response to heat treatment gives the parts hard surfaces around tough cores providing maximum resistance to abrasion, friction, and wear. An exceptionally high strength-to-weight ratio permits the designing of thinner sections to save weight and hold down size. Send coupon for full facts.

REPUBLIC STEEL



*World's Widest Range
of Standard Steels and
Steel Products*

REPUBLIC STEEL CORPORATION

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Please send more information on:

- ☐ Stainless Steel ☐ HS 6460 Powder
☐ Die-Form ☐ Alloy Steels

Have a metallurgist call

- ☐ Stainless ☐ Alloy ☐ Metal Powder

Name _____ Title _____

Company _____

Address _____

City _____ Zone _____ State _____



News of "material" interest

New and improved thermoplastics are giving automotive designers and engineers a new dimension in which to work. Old barriers to progress, set by less versatile materials, are being broken by these modern materials with the most to offer in the way of product improvement and production economies. Here are examples of such developments which are materially aiding automotive men . . . right now.

You may wish to check certain items in this advertisement and forward to those concerned in your own company.

ROUTE TO:

LATEX FINISHES REDUCE FIRE HAZARDS ON AUTOMOTIVE PAINT LINES

The magic of latex masters metal in new Dow Latex 566 for baked automotive primers. These new water-thinned coatings reduce fire hazards in paint departments. They can materially reduce insurance risks — improve coating performance.

There may soon be something missing around many spray booths and dip tanks in modern automotive paint departments. It's the expensive fire prevention equipment that now guards this hazardous area of automotive production.

The omission will be intentional, however. Revolutionary Dow Latex 566 can make the man in the spray

booth as safe from fire as a man sprinkling his lawn.

For much the same reason that it's cheaper to insure a water tank than a gasoline storage tank, insurance rates can drop when this new and modern material replaces conventional solvent-thinned paints. The thinner for finishes based on Dow Latex 566 can be drawn from any convenient water tap.

But Dow Latex 566 does more than lessen fire hazards. With it, industrial paint firms formulate superior finishes for metal.

The most startling new benefits in the use of Dow Latex 566 are linked to the fact that it is not a solution but a dispersion of discrete resin particles. Because molecular weight is not limited by viscosity, coatings requiring the additional properties derived from higher molecular weight than obtainable from conventional solvent systems may be formulated at spraying viscosities.

In addition to primers and finishes for parts, Dow Latex 566 promises excellent possibilities for other automotive applications. Complete information on the background and future of these revolutionary finishes can be obtained from Dow.

But first, check this next Dow thermoplastic material that builds gridiron durability into shop equipment . . .



ETHOCEL:**Football helmet toughness for headlight aim housing**

Shop equipment like this headlight aim housing has to withstand treatment as rugged as you're apt to find anywhere . . . even on the pro football gridiron.

That's why it's made of Ethocel®, the same tough, versatile material that goes into modern football headgear. Ethocel provides the greatest toughness and highest impact strength available over the widest temperature range of any thermoplastic. It withstands extreme shocks, resists chemicals. The dimensional stability of Ethocel means parts fit perfectly. And the glossy, attractive surface is easy to keep that way.

Investigate this rugged ethylcellulose molding compound for applications which demand its toughness, high impact strength and shock resistance.

If you aren't already profiting from these and other Dow thermoplastics, discover how you can. We suggest you write for complete information to **Plastics Sales Department 1676T4-15, THE DOW CHEMICAL COMPANY, Midland, Michigan.**

TYRIL:**Saves air conditioner maker a cool 19 production steps**

One of the beauties of automotive air conditioning is right here . . . in this trim air conditioner housing made of Tyril® that resists dents, scratches, heat distortion, chemicals and oil.

Its maker finds real air conditioning comfort, however, in the fact that this tough, versatile styrene acrylonitrile copolymer cuts a total of *nineteen* steps out of the production line. That's right—19, including spot welding, cleaning, buffing and painting.

And, unlike metal, this housing can't rust or corrode in use. Tough, resistant, versatile. Tyril assures long life and precision fit for many molded parts.

MORE NEWS . . . to help you profit materially

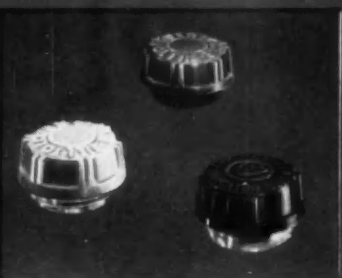
DOW POLYETHYLENE 990M. Excellent rigidity and elongation made it the specified material for this litter basket. Smooth, uniform flow permits low cost production by deep draw injection molding.



TYRIL. Special properties of heat resistance, toughness and color versatility made this comparatively new Dow thermoplastic the natural choice for this speed alerter assembly.



SARAN. No fouled gas lines, thanks to this SARAN filter which eliminates water and foreign material before gas leaves the tank. Hidden from sight, it has to be permanent, resist fuels and additives.



STYRON® 683. Passes the acid test for battery caps and name plates. Provides excellent acid resistance, adequate heat resistance. Colorful caps provide bright brand identification, too.

**DOW PLASTICS
BASIC TO THE
AUTOMOTIVE
INDUSTRY**

Molding Materials
Coatings
Extrusion Materials
Sheeting
Fabric Resins

THE DOW CHEMICAL COMPANY
Midland, Michigan



OLIN
ALUMINUM
GLISTENS
ON
AMERICA'S
FINE
CARS



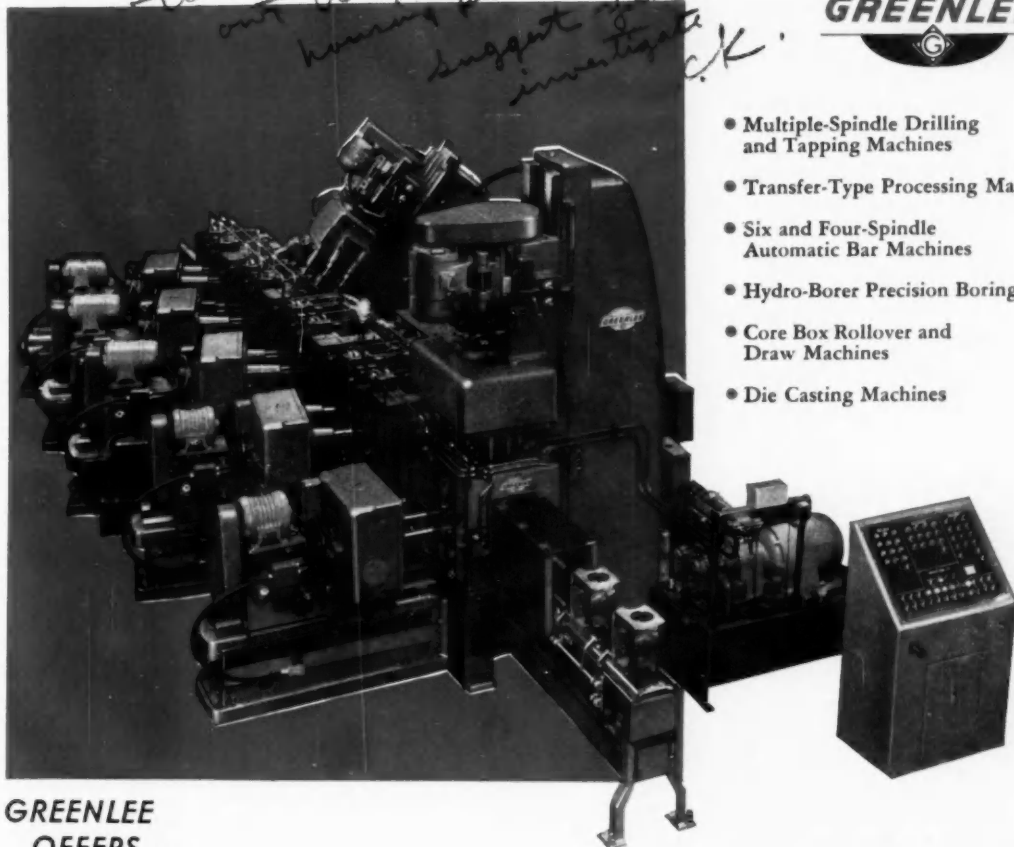
OLIN
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our transmission
housing problems.
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investigate
C.K.*



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- Hydro-Borer Precision Boring Machines
- Core Box Rollover and Draw Machines
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MACHINES DESIGNED WITH THE FUTURE IN MIND

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BROS. & CO.

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MUST "WALK A STRAIGHT LINE"
TO ASSURE PERFECT BALANCE

Probably the most important single quality in a clutch is *balance*—because balance means smoothness of operation, not only of the clutch but of the engine as well.

That's why Borg & Beck clutches are checked for balance, at operational speeds, on specially designed test machines. Even the slightest unbalance is instantly detected and carefully corrected. Perfect balance is assured, as shown above, when the electric beam of the oscillograph is vertically straight on the calibrated screen. And every Borg & Beck clutch must "walk this straight line" before it passes inspection.

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AUTOMOTIVE INDUSTRIES, April 15, 1959



it will still be as beautiful
when she grows up

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STAINLESS STEELS

Yes . . . when she's ready to drive her own car, she too will want the long lasting beauty and protective qualities of solid stainless steel trim . . . and if this car is still around, the trim will be just as beautiful as it is today.

For stainless that offers maximum ease of fabrication and lasting, lustrous finish, specify Uniloy Stainless Steel.

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BRIDGEVILLE, PA.

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Remarkable, resilient **FAIRPRENE**[®] performs continuously to 500°F; resists fuels, lubricants, solvents and harsh chemicals

PHYSICAL PROPERTIES

	Original	After 72 hrs. in dry air at:	
		450°F	500°F
Tensile strength	1410	1270	1173
Elongation, Ultimate, %	200	153	153
Durometer, Shore A	75	75	80

Tests were made on new "Fairprene" fluoroelastomer sheet stocks of .043" gauge and 24" width. Tests show excellent maintenance of basic properties to 500°F.

Now, Du Pont research has developed an elastic, resilient material—"Viton" A fluoroelastomer—with remarkable high-temperature and chemical resistance. In tests, "Fairprene"* sheet stocks and coated fabrics of this new material for gasketing and diaphragm show excellent maintenance of basic properties at 500°F. This new "Fairprene" resists acids, alkalies, ozone and weathering. It resists swelling and deterioration in solvents, oils, lubricants and fuels. For more information about these new "Fairprene" sheet stocks and coated fabrics of amazing "Viton" A*, mail the coupon—no obligation.

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Fluid or Fuel Specification	Temperature level—°F	Volume swell—%
JP-4 Fuel (Kerosene-base jet fuel)	212	1.7
JP-5 Fuel (Kerosene-base jet fuel)	350	5.9
Univis J43 Hydraulic Fluid (Oil type)	500	5.9
Turbo Oil #15 (Diester-type lubricating oil)	500	16.0
ASTM #3 Oil (Petroleum base, low aniline point oil)	500	8.5
ASTM #1 Oil (Petroleum base, high aniline point oil)	500	0.0
OS45 (Silicate ester base hydraulic fluid)	350	6.5
SR6 (High aromatic test fluid)	Room Temp.	3.4
SR10 (High aliphatic test fluid)	Room Temp.	0.0
Benzol (Basic aromatic hydrocarbon solvent)	Room Temp.	19.3

Tests were made on new "Fairprene" fluoroelastomer sheet stock of .043" gauge and 24" width. Information on fluids or fuels not included can be developed by our laboratory on request.

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COATED FABRICS
SHEET STOCKS • CEMENTS**



BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

*"Fairprene" is Du Pont's registered trademark for its coated fabrics, sheet stocks and cements. "Viton" A is Du Pont's registered trademark for one of its synthetic rubbers.

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precise, adjustable
reciprocating stroke

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HONING, LAPPING,
GRINDING, SCRAPING

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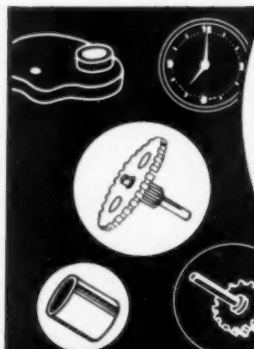
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Saves costly hours of tedious hand labor on concave, convex and flat surfaces — and especially on hard-to-reach details of dies, molds, tools. The fast, precise reciprocating action can be varied from 0 to 100 strokes per second, with length of stroke from 0 to 1/4 inch. Moderate in price, the Di-Profiler, with its many versatile accessories, pays for itself quickly through time-saving cost reduction.

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Borg-Warner Industrial Cranes

Quality at a price you can afford . . .

\$9900⁰⁰

For a 7 1/2-Ton,
60 Ft. Span, 3 Motor,
Top-Running Double Girder
Industrial Service Crane

Value is determined by **QUALITY** and **PRICE** . . . and, a price like this for superior Borg-Warner Industrial Cranes construction and performance assures you of top value for your materials handling investment.

If you want to boost your production and operating profits by making full use of overhead space for materials handling . . . if you can use the extra storage space an overhead crane will provide as compared with fork-truck stacking . . . if you can benefit from aisles and work areas cleared of floor-type handling equipment . . . it will pay you to consider a Borg-Warner top-running, motor-driven crane like this. The cost may be far less than you had imagined. One crane owner thought it would cost him nearly four times this price to duplicate his crane.

Borg-Warner Industrial Cranes offers a complete line of overhead cranes . . . for light, medium or heavy service . . . constant or intermittent service at slow, medium or high speeds . . . operation from cab or floor. Get in touch with B-W Industrial Cranes today for answers to your materials handling problems.

QUALITY—MODERN DESIGN

- Full 7 1/2 tons rating with ample reserve capacity
- Heavy duty hoist
- Heavy duty steel wheels on bridge and trolley
- All welded jig bored and jig assembled end trucks
- Long life precision ball and roller bearings
- Large gusset plates at end trucks
- Outrigger machinery girder construction
- Heavy duty gear reduction bridge drive
- Fluid coupled bridge and trolley drives
- Full magnetic push button control
- Magnetic bridge brake



The crane illustrated is a typical double girder installation. For shorter spans, smaller capacities and lighter or intermittent duty Borg-Warner Industrial Cranes can supply your needs at even lower prices.



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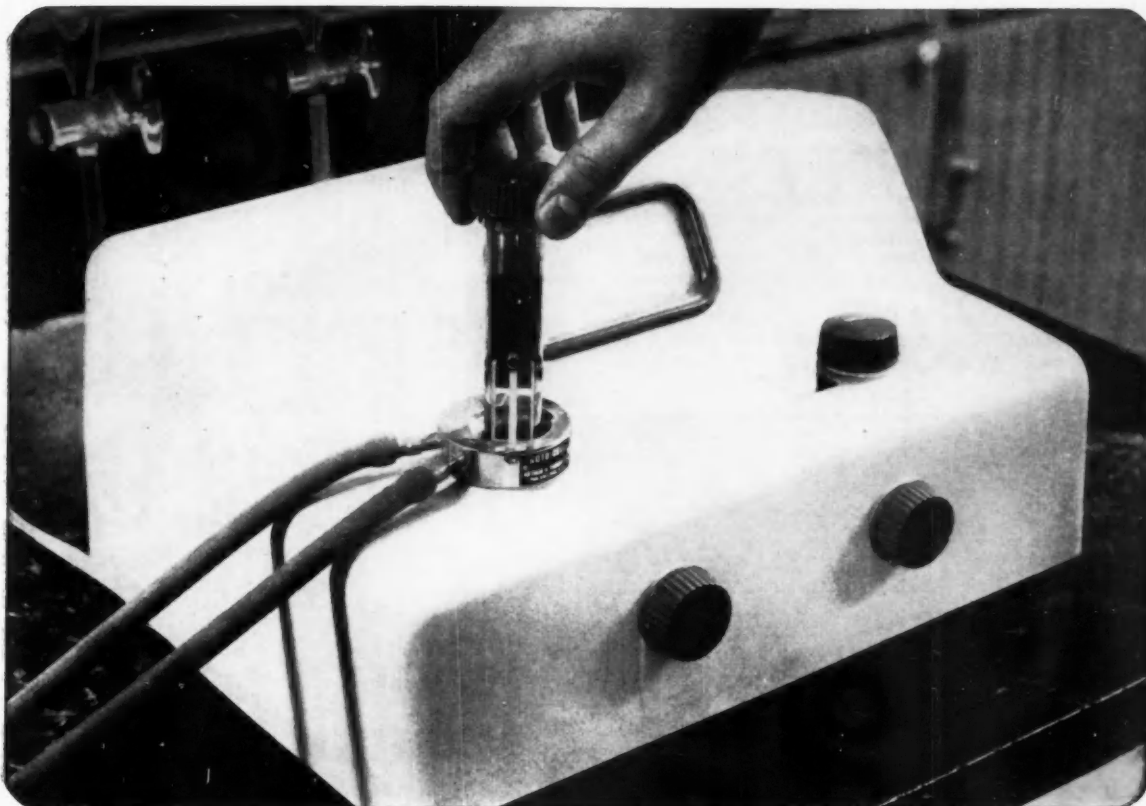


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industrial cities

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Experience—the added alloy in Allegheny Ludlum tool steels



COLORIMETER (inherently extremely accurate) determines percentages of molybdenum, tungsten, cobalt and manganese in A-L tool steel to insure consistent, high quality.

Colorimeter measures exact chemical composition of Allegheny Ludlum tool steel melts

Accurate adjustment of alloys guarantees uniform heat treatment, predictable dimensional changes, reduced grinding, standardized machining operations.

Close control of molybdenum, tungsten, cobalt and manganese is at the heart of a good tool steel melt. In addition to the usual testing methods, Allegheny Ludlum's chemical laboratory checks these metals with Colorimetry because of its inherent, extreme accuracy.

On the basis of the Colorimeter's findings, it is possible to make carefully calculated furnace additions of ferro-alloys, insuring precise control over chemistry. This guarantees your receiving the *exact* analysis order after order, providing *uniformity of heat treatment, predictable dimensional changes, reduced grinding and standardized machining operations.*

WW-7262

Colorimetry is but one step toward careful control over composition. Allegheny Ludlum also sets exacting purchasing specifications on raw materials and scrap. Quality Control checks all incoming orders to see that they conform with these specifications. Another guard toward your getting your exact specifications: each ingot bears a metal tab showing heat number.

Allegheny Ludlum stocks a complete line of tool steel sizes and grades. Call your nearest A-L representative; you'll get quick service and counsel on such problems as heat treating, machining, grade selection, etc. Or write for A-L's publication list which gives full data on the more than 125 technical publications offered. They'll make your job easier.

ALLEGHENY LUDLUM STEEL CORPORATION,
Oliver Bldg., Pittsburgh 22, Pa. Address Dept. AL-16

ALLEGHENY LUDLUM

Tool Steel warehouse stocks throughout the country... Check the yellow pages
every grade of tool steel... every help in using it

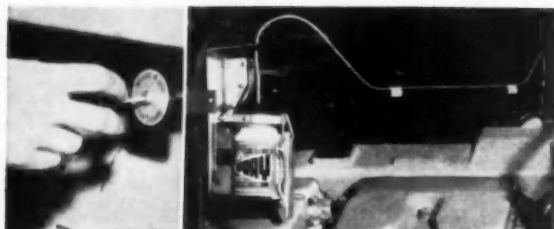


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STARTS COLD DIESEL & GASOLINE
ENGINES INSTANTLY!

INSTNSTART insures quick starts for cold diesel and gasoline engines all year 'round. (Until an engine reaches normal operating temperature it is a cold engine.) The driver or pilot pulls a knob at his fingertips releasing enough fluid necessary to sustain combustion regardless of weather conditions. INSTNSTART APPLICATORS employ our economical pressurized can of Spray Starting Fluid. This safe, convenient, closed system has been well received in the U. S. and abroad. Quicker starts with INSTNSTART eliminate down-time and prolong engine and electrical system life. It can be installed in minutes with a screw-driver and drill.



*Patent Pending

▲ A cover, not shown, protects the mechanism.

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GREY IRON CASTINGS

ONE OF THE NATION'S
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ESTABLISHED 1866

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FOUNDRY DIVISION

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Templates**

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Write for sample on company letterhead
THE DYKEM COMPANY
2301-L North 11th St. • St. Louis 8, Mo.

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CUT SCRAPER TIME

END NIGHT CLEANUP & MORNING REBLUING

DYKEM HI-SPOT BLUE No. 107 is used to locate high spots when scraping bearing surfaces. As it does not dry, it remains in condition on work indefinitely, saving scraper's time. Intensely blue, smooth paste spreads thin, transfers clearly. No grit; noninjurious to metal. Uniform. Available in collapsible tubes of three sizes. Order from your supplier. Write for free sample tube on company letterhead.

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Index to Advertisers

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A	
AMP, Inc.	85
Ackermann Mfg. Co.	10
Air Reduction Sales Co.	16
Alemite Div. Stewart-Warner	11
Allegheny Ludlum Steel Corp.	123
Amplex Div. (Chrysler Corp.)	99
Anaconda Aluminum Co.	108
Armstrong Cork Co.	
Industrial Div.	35
Automotive Industries	126

B	
Babcock & Wilcox Co.	
Tubular Products Div.	2
Bendix Aviation Corp.	
Products Div.	5
Bendix-Westinghouse Automotive	
Air Brake Co.	102-103
Bethlehem Steel Co.	1
Borg & Beck Div.	118
Borg-Warner Corp.	122
Bower Roller Bearing Div.	105
Bundy Tubing Co.	14-15
Burton Auto Spring Corp.	69

C	
Carr Fastener Co.	98
Celanese Corp. of America	107
Chrysler Corp. (Amplex Div.)	99
Clark Equipment Co.	109
Classified Advertisements	106
Clearing Div.	
U. S. Industries, Inc.	59
Continental-Diamond Fibre Co.	110
Copperweld Steel Co.	
Superior Steel Div.	19

D	
Dana Corp. (Spicer)	20
Dow Chemical Co.	114-115
Dow Corning Corp.	96, 122
du Pont de Nemours & Co., E. I.	
Fairprene	121
Dykem Co.	124

E	
Eaton Mfg. Co.	
Dynatomic Div.	111
Electric Auto-Life Co.	
Electrical Products Group	74-75
Engis Equipment Co.	
Hyprez Div.	122

F	
Fairfield Mfg. Co.	84
Federal-Mogul-Bower Bearings, Inc.	
Bearings Co. of Amer. Div.	88
Bower Roller Bearing Div.	105
Federal-Mogul Div.	79
National Seal Div.	12
Firestone Steel Products Co.	87

Ford Motor Co.	
Industrial Engine Dept.	101
Fuller Mfg. Co.	81

G	
Garlock Packing Co.	94
Gisholt Machine Co.	6
Goshen Rubber Co., Inc.	82
Greenlee Bros. & Co.	117

H	
Hannifin Co.	86
Hansen Mfg. Co.	78
Heald Machine Co.	2nd Cover
Holley Carburetor Co.	31

I	
Illinois Tool Works	
Shakeproof Div.	89
Inland Steel Co.	61

J	
Johnson Products, Inc.	90
Jones & Laughlin Steel Corp.	
Stainless & Strip Div.	91

K	
Keuffel & Esser Co.	124

L	
Lamb Electric Co.	97
Lilly & Co., Eli	95
Lipe-Rollway Corp.	83

M	
McLouth Steel Corp.	65
Mallory & Co., Inc., P. R.	57
Marbon Chemical Div.	76
Midland-Ross Corp.	63
Miller Dial & Name Plate Co.	106

N	
National Aniline Div.	119
National Screw & Mfg. Co.	64
National Seal Div.	12
New Britain Machine Co.	
New Britain-Gridley Machine Div.	29-30
New Departure Div.	Back Cover
Norton Co.	32-33

O	
Olin Mathieson Chemical Corp.	116
Osborn Mfg. Co.	104

P	
Pennsalt Chemicals Corp.	13
Purulator Products, Inc.	66

R	
Ransburg Electro-Coating Corp.	80
Republic Steel Corp.	112-113
Rockford Clutch Div.	100

S	
Sealed Power Corp.	73
Shakeproof Div.	
Illinois Tool Works	89

S	
Southern Screw Co.	77
Spray Products Corp.	124
Stewart-Warner Corp. Alemite Div.	11
Studebaker-Packard Corp.	
Parts & Service Div.	73
Sun Oil Co.	17
Superior Steel Div. (Copperweld Steel Co.)	19

T	
Taylor Fibre Co.	8
Timken Roller Bearing Co.	9
Torrington Company	71
Tung-Sol Electric, Inc.	
Electroswitch Div.	18

U	
U. S. Industries, Inc.	
Clearing Div.	59
United Carr Fastener Corp.	98
United States Gasket Co.	94
Universal Cyclops Steel Corp.	120

V	
Victor Mfg. & Gasket Co.	7

W	
Wagner Electric Corp.	34
Westinghouse Electric Corp.	
Standard Control Div.	92-93
Wheland Co.	124

Y	
Yoder Company	106

Z	
Zollner Corp.	3rd Cover



Assembly line inspection photo courtesy of MUSKEGON PISTON RING COMPANY...one of the 6,202 plants comprising the \$32-billion automotive and aviation manufacturing market reached by AUTOMOTIVE INDUSTRIES

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Piston rings, brake shoes, distributors, spark plugs, shock absorbers, fan belts and all the hundreds of things that are wearing out every day on your car mean big business for replacement parts manufacturers. In order to *produce*, these manufacturers must buy tools, supplies, materials and services—and lots more of them, as parts-needing cars grow older.

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FREE LITERATURE

Industrial Trucks 1

A 12 page catalog classifies powered industrial truck types under six categories: fork trucks, heavy duty fork and ram trucks, low lift platform trucks, high lift platform trucks, die handling trucks, and mobile cranes. Within each category is listed complete specifications for all models. *Elwell-Parker Electric Co.*

Machine Chassis 2

An eight page illustrated brochure explains the advantages of a line of turret type chassis for special purpose processing and assembly machines. It points out features, gives dimensional and operational data, and shows examples of how they are used for machines that perform a wide variety of automatic operations. *Swanson-Erie Corp.*

Air Control Valves 3

The Hannifin "Valve Finder," featuring an informative discussion of air valves and their selection together with condensed catalog listings of all Hannifin valves, has been prepared by Hannifin Co., a Div. of Parker-Hannifin Corp.

Stainless Pipe 4

Bulletin U, eight pages, describes "L" grade (0.03 maximum carbon) stainless pipe and tube called "Union-weld." Variations, including drawn tube with ID bead removed, are described and tolerances for pipe and tube standard products are included. *Union Steel Corp.*

Gear Checker 5

Technical Bulletin 607 covering its compact and versatile gear checker designed for roll checking the most widely used range of gear sizes is available from Michigan Tool Co. The checker will indicate rolling errors on a dial gage in increments of 0.0005 in.

Brass Data 6

Bridgeport Brass Co. has published a six page catalog showing the importance of grain size of brass alloys. It explains how the selection of the correct ultra fine grain size can reduce finishing costs. It also shows the effects on brass strip of annealing and cold rolling.

(Please turn page)

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21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140
141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160
161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180
181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200
201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220
221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240
241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260
261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280
281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300

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FREE LITERATURE—Continued

Lightweight Locknut 7

Featherweight locknuts which combine exceptional strength-to-weight ratio with good fatigue characteristics and high re-usability are described in four page Form 2487. Called FN 22 series, the nuts are designed for use at temperatures to 550 degrees in aircraft applications. *Standard Pressed Steel Co.*

Motor-Alternator Sets 8

Four page Bulletin GET-2906 describes high-performance, statically-controlled 400 cycle motor alternator sets up to 5 kva, 3 phase output. The units are used for ground power sys-

tems, component or system testing, missile ground check out equipment and other requirements for either stationary or vehicle-mounted applications. *General Electric Co.*

Long Lift Air Hoist 9

Bulletin 861, covering a line of long lift air hoists, lists sizes, capacities and dimensions of type "PL" air hoists. *Detroit Hoist and Machine Co.*

Flexible Shafts 10

Bulletin 590 gives data on Stow high speed power drive flexible shafting. Complete dimensional data on

all sizes as well as information on the torque ratings in different bends and the maximum operating speeds are contained. *Stow Mfg. Co.*

Heat Treating Furnaces 11

Twelve page Bulletin 653A describes a complete range of electric and fuel fired heat treating furnaces and protective atmosphere generators manufactured by *Hevi-Duty Electric Co.*

Ground Flat Stock 12

Bulletin M80 is a combination catalog and price list showing the availability of a complete line of precision ground tool steel and low carbon ground stock. *Brown & Sharpe Manufacturing Co.*

Power Shear 13

A two page bulletin illustrates and discusses *Famco Hi-Speed* power shears equipped with a pneumatic friction clutch and brake. The shear operates at 300 spm and completes one stroke in 0.20 of a second. *Famco Machine Co.*

Hydraulic Cylinder 14

An economical 1½ in. bore hydraulic clamp-type cylinder, designed especially for automation tooling and production line applications, is described in four page Bulletin 159. *The Sheffer Corp.*

Carbide Catalog 15

Adamas Carbide Corp. has issued 32 page Catalog 359, describing and illustrating their complete line of tungsten carbide tools, tool tips, dies, wear parts and *Dex-A-Tools*.

Profilometer Catalog 16

A 12 page catalog illustrates and describes all available instruments together with several special items which show the versatility of the *Profilometer*, which is used for the measurement of surface finish. *Micro-metrical Mfg. Co.*

Postcard valid 8 weeks only. After that use own letterhead fully describing item wanted.

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41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
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Diamond Wheels 17

Form ESA-290, 48 pages, contains many items including consumer net prices for both man-made and natural diamonds. Also included is a table of recommended grain and grade specifications for man-made and natural diamond grinding wheels for the common operations performed in sharpening carbide tipped tools and grinding cemented carbides. *Simonds Abrasive Co.*

Auto-Tracer Lathe 18

An eight page brochure describing the Model 30 auto-tracer lathe covers the machine's automatic tracing cycles, variable components available, with design features and specifications. Controls for quick setup and operation are explained. *Jones & Lamson Machine Co.*

Master Spur Gears 19

An eight page catalog outlines the large stock of standard fine pitch master spur gears available from *Invo Spline, Inc.* Diametrical pitch, pitch diameter, and face width and bore are clearly indicated for each gear.

Surface Grinder 20

Catalog CGS-59 describes and illustrates the complete line of Landis abrasive precision surface grinders. Complete specifications and features are included. Sizes range from 6 by 18 to 12 by 30 in., for both hand operated and hydraulic machines. *Landis Tool Co.*

Molding Machines 21

Bulletin 5830-A describes a complete line of machinery for molding plastics. This includes injection machines (both conventional and pre-plasticizing); compression, transfer and reinforced plastics molding presses; and special machines. *The Hydraulic Press Mfg. Co.*

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Dressing Tools

22

Precision diamond dressing tools are the subject of a four page, illustrated folder offered by the *Permat-tach Diamond Tool Corp.* All of the basic dressing tool types are outlined and the particular uses of each type are described.

Stainless Steel

23

Stainless steel physical properties and analyses, surface finishes, fabrication, maintenance, etc., are given along with detailed information on all commercial stainless sheet and strips produced by *Washington Steel Corp.*, in a 36 page booklet.

Electric Actuators

24

Bulletin 1300 describes a line of electric actuators—28 v, 400 cycle motors, screwjacks, gear boxes and control equipment—for aircraft, missile, ordnance, marine, and industrial applications. *Hoover Electric Co.*

Cemented Carbides

25

A reprint of a 32 page catalog, "Cemented Carbides for Industry," includes new and additional information on brazed tools, carbide inserts, tool holders, and blanks. *Carmet Div., Allegheny Ludlum Steel Corp.*

Brazing Flux

26

Engineering data sheet No. 2.2.3 discusses Microbraz Vapo-Flux, which produces good wetting and flow of brazing alloys in marginal or poor dry hydrogen atmospheres. *Wall Colmonoy Corp.*

Tap Extensions

27

A line of tap extensions (or tap holders), designed specifically for machine tapping operations, is described in Catalog Sheet 9500 issued by *The Walton Co.*

Rust Resistant Coatings

28

Bulletin 259 charts protective coatings for various products where corrosive spillage, fumes and atmospheres are involved and for tank linings. *Wisconsin Protective Coating Corp.*

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